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The Value Base of Water Governance in the Upper Paraguay River Basin, Mato Grosso, Brazil

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Declaration

I declare that this thesis presented for the degree of Doctor of Philosophy (PhD) has been composed solely by myself and that it has not been submitted in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgement, the work presented is entirely my own. Part of this work has been published in:

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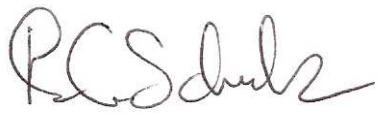

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Lay summary

This PhD project was about studying the role that values play in public water management. To understand how values are related to water management in theory and in practice, the PhD consisted of three different research stages. In the first stage, theoretical literature about values was reviewed, coming from economists, philosophers, psychologists, and geographers. This review showed that there are different ways to understand the word 'value'. It can either be seen as a guiding principle, for example the principle that we should care about others. Or it can be seen as a quality of a thing, so for example, water has value because we can drink it and it helps us to survive. There are also two types of guiding principles: those that are important for most decisions (such as 'caring about others') and those that are important for water management and public administration (for example 'not to waste taxpayers' money'). Based on this review, a new theory was proposed (the 'value landscapes approach') which suggests that these different types of values can all be important for doing research on water management, because they influence how the people in water management take decisions. Also, depending on their values, people may have different opinions and preferences about what should be done in water management. For example, if someone thinks that it is most important to care about the poor and powerless (the value or guiding principle of social justice) they may prefer a different management option than someone who thinks it is most important to create economic growth.

To test whether this theory of values can help to understand conflicts about water management in real life, a case study was done in the region of the Upper Paraguay River in the Brazilian state of Mato Grosso. This area is important globally, because it contains the largest freshwater wetland in the world, the Pantanal, and because nearby, large amounts of soybean and other agricultural

products are grown that are then exported to the world markets, especially to China. The government of Mato Grosso is planning to build a waterway through the Pantanal wetland to help reduce the cost of shipping these products abroad. To do so, some engineering works would need to be done on the Paraguay River, such as making it deeper, so bigger ships can travel there year-round. Environmentalists and many local people are worried about the impacts that this may have on the plants and animals of the Pantanal, many of which are in danger of extinction.

In this second stage of the research, 24 people who work in sectors that are related to water in one way or another, such as fishing, agriculture, government or research were interviewed about values and water management in the region. The result was that the people who are in favour of the waterway have similar values to each other, for example they all see water as an economic resource that can be used to make money. The people who were against the waterway mostly cared about water because of their traditional culture, which is closely related to the region's rivers, not least because many people live off fishing. Both groups did not have many values in common and also had different ideas about guiding principles for water management, so it appeared that they disagreed about the plans for the waterway partly because of their different values.

In the third stage of the PhD, 1067 members of the general public were interviewed at their homes using a survey with pre-defined questions and answer categories to understand whether they, too, related values in the same way as the professionals that had been interviewed previously. This would be important to improve theories about values. And indeed, also among average citizens two groups could be found, one that was in favour of the waterway and one that was against, and more notably, their values were different from each other. The first group seemed to care less about themselves and more about others, thought it was important that the opinion of the people be heard in water management, and that water is important for the environment and for cultural reasons. The second

group cared more about themselves and less about others, thought it was important that water management did not waste money and followed the law, and thought water was important to produce economic values.

These findings help us to understand values and their connection with water management better, because it could be shown that even basic principles such as whether a person cares more about herself or about others, influence this person's opinions about water management. Also, it was found that the plans of the government of Mato Grosso to build the waterway through the Pantanal do not match with the opinions and values of the majority of people who live in the area surrounding the Paraguay River. This means that the conflict around the construction of the waterway can be interpreted as a conflict of opposing values, and that the proposed theory has relevance for real life case studies. Because such a large number of people was interviewed following standardised procedures, it is also possible to claim that the findings are representative for the general population in the region.

Abstract

Values have been identified as important factors that guide decision-making and influence preferences in water governance. Comparing the values reflected in water governance decisions with the values held by stakeholders and the general public may inform the debate on the political legitimacy of water governance. The research presented in this PhD thesis draws on multiple research traditions on values, ranging from ecological economics and political ecology to social and environmental psychology, to investigate the value base of water governance in the Upper Paraguay River Basin, in the state of Mato Grosso, Brazil. It first introduces a novel conceptual framework that integrates these various research traditions and suggests that water governance is closely related to the fundamental values, governance-related values, and assigned values of stakeholders and actors in water governance more generally. These different types of values vary in their level of abstractness, as well as in their 'locus', i.e. where the valuing person locates them, and are hypothesised to be closely interrelated in a hierarchical structure, with fundamental values being the most abstract type of values. Water governance, in turn, is defined as the synthesis of water policy (the 'content' of decision-making), water politics (the 'power play' between actors) and water polity (the institutional framework). The thesis then proceeds to apply this novel conceptual framework in a case study on stakeholders' values in the Upper Paraguay River Basin, and investigates the relationship of their values with their preferences regarding the construction of the Paraguay-Paraná Waterway through the Pantanal wetland, in the south of Mato Grosso. This water infrastructure project has a long history of conflict attached to it, as it might impact the hydrology and ecology of the Pantanal, the world's largest tropical freshwater wetland and UNESCO biosphere reserve, while at the same time benefitting Mato Grosso's rapidly growing agribusiness sector by lowering the cost of soybean exports. Based

on 24 semi-structured interviews with relevant stakeholders, it was found that supporters and opponents possess different, clashing 'value landscapes' (i.e. groups of related values), which may explain the protracted nature of the conflict around the construction of the waterway, while at the same time highlighting political legitimacy deficits of the project. This research was followed up by a quantitative study with members of the general public (n=1067), which sought to measure and test the assumption that we can empirically identify such clashing value landscapes, and their relationship with preferences for or against the Paraguay-Paraná Waterway. Using structural equation modelling (SEM), statistically significant links between people's values and their preferences in water governance could indeed be found, as well as between different types of values, which formed two contrasting value landscapes. This suggests that water governance conflicts may in part be explained by the presence of different value landscapes among involved actors, which may include even the most abstract level of fundamental values. The research presented in this thesis thus contributes to interdisciplinary debates on the role of values for water governance from multiple conceptual, as well as methodological perspectives. Additionally, through its application to a concrete case study, it highlights the policy relevance of such research, as addressing conflicts in water governance and examining alternative policy options may require a more explicit consideration of the values of the actors involved.

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Chapter 1:
Introduction

1.1 Values and valuation

Values and associated processes of valuation have been of interest to researchers and philosophers since ancient times, and the subject has taken a prominent position in the academic and non-academic debate. Values, on the one hand, can be conceptualised as guiding principles, i.e. as abstract goals that may guide decision-making (Schwartz et al. 2012). On the other hand, values can be understood as measurements, i.e. a description or quantity of something (Bigger & Robertson 2017). While the concept of 'value' may appear simple on first sight, it has a wide variety of far-reaching questions attached to it, which may never receive a definite answer. These are, among many others: the moral and ethical questions of what is right and what is wrong (Daube & Ulph 2016; de Silva 1998; Falk & Szech 2013); the question of intrinsic values, and which objects should be characterised as intrinsically valuable (McDonald 2004; Næss 1984; O'Neill 1992); the question of whether values can be ranked and/or translated into each other, which had already been discussed by Plato (Bengston 1994; Martinez-Alier et al. 1998; Seung & Bonevac 1992); the question what are the sources and origins of value (Gómez-Baggethun et al. 2010; Marx [1867] 1962; Walker 2017); and the many questions related to the measurement and capture of values for various applied purposes that dominate the environmental valuation literature today (Bateman et al. 2002; Jones, Shaw, et al. 2016; Song et al. 2013; Tadaki et al. 2017).

The wide-ranging nature of the many questions associated with values, the multifaceted character of the concept itself, and the abstract character of values which come into play across an infinite number of situations and contexts, have made it a core concept in several different academic disciplines, including

philosophy, economics, psychology, and others. The study of values is and never will be irrelevant, as evidenced by countless PhD theses (e.g. Briceno 2013; Mohamed 2012; Russo 2013; Talukdar 2007), monographs (e.g. Allingham 1983; Bailey [1825] 1967; Groenfeldt 2013; Rokeach 1973), journal articles (e.g. Kallis et al. 2013; Lockwood 1999; Robertson & Wainwright 2013; Tadaki et al. 2017), and special issues (e.g. Costanza & Farber 2002; Euzen & Morehouse 2011; Kenney-Lazar & Kay 2017; Söderqvist et al. 2000) published on the subject.

In relation to the environment, some of the major research questions concern the measurement and calculation of environmental values in monetary and non-monetary terms (e.g. Bateman et al. 2002; Hanemann 2006; MA 2005), the distribution of environmental costs and benefits (e.g. Adekola & Mitchell 2011; Martinez-Alier 2002; Pearce 2006), and the values that should and are guiding decision-making in environmental governance, and environmental behaviour more generally (e.g. Glenk & Fischer 2010; Steg & Vlek 2009; Tortajada 2010). In the present thesis, all of these aspects are covered to some extent, but a special focus lies on interconnecting various perspectives on values and valuation, drawing on a wide variety of research traditions. Furthermore, here, values are not studied in isolation but in view of their role in water governance, i.e. how they underpin preferences for water management decisions. For that, the research uses the local situation in the Upper Paraguay River Basin of the Brazilian state of Mato Grosso as a case study.

1.2 Research objectives and rationale

In the contemporary literature, water governance takes on two separate, yet related meanings. On the one hand, it is an analytical term that describes the configuration of state-society relations in the management of water resources, which may fall anywhere between centralised state-led decision-making to participatory local governance to market-based approaches. On the other hand,

water governance has come to denote a normative understanding that water resources should be managed jointly between the state and society, using participatory institutions and often involving economic governance instruments (Castro 2007). The normative understanding of water governance explicitly favours values such as participation and economic efficiency; moreover, many studies evaluate water governance in different local scenarios in view of various governance-related values such as sustainability (e.g. Iribarnegaray & Seghezzo 2012; Kuzdas et al. 2014), efficiency and effectiveness (e.g. Lieberherr et al. 2012; Wang et al. 2010) or social justice (Lukasiewicz et al. 2013; Wutich et al. 2013). However, such case studies typically focus on individual values, which more often than not are not explicitly recognised as values. Systematic evaluations of the values that guide stakeholders and actors in water governance are rare, although vague calls 'to take values into account' are not uncommon (e.g. Syme & Hatfield-Dodds 2007).

The present PhD thesis aims at uncovering the implicit value base that guides decision-making in water governance and interprets both conflicts and cooperation among different actors as the result of different underlying values. The multiple elements of the PhD research project all sought to contribute to one broad central research question:

> *What theoretical and empirical links can be established between different types of values, and between values and decision-making and preferences in water governance?*

The PhD thesis follows an interdisciplinary approach on values, incorporating elements from ecological economics, political ecology, and social and environmental psychology, which in turn have their foundations in economics, philosophy, psychology and human geography more generally. Specifically, it proposes a novel conceptual framework on the basis of three types of values are extracted from these various research traditions:

1) Fundamental or held values, which are defined as desirable, transsituational goals that guide human decision-making more generally (Fulton et al. 1996; Rokeach 1973; Schwartz 1992; Schwartz et al. 2012);
2) assigned values or water values, which are the multiple uses of water or values that humans assign to water resources (Brown 1984; Ioris 2012a; Jones, Ross, et al. 2016; Lockwood 1999; Seymour et al. 2010); and
3) governance-related values, i.e. the idealised characteristics or properties of (water) governance that are expressed as desirable by individuals and groups (Glenk & Fischer 2010; Ingram 2011; Tortajada 2010).

These different types of values vary in their level of abstractness, as well as in their 'locus', i.e. where the valuing person locates them, and are hypothesised to be closely interrelated in a hierarchical structure. Fundamental values are the most abstract type of values that is located inside people's minds, whereas assigned values are the most concrete type of value that people locate inside water resources. Governance-related values take an intermediate position. Groups of interrelated values that jointly influence preferences and decision-making in water governance among individuals and groups of actors are metaphorically termed 'value landscapes' that, as this PhD research seeks to demonstrate, can be theoretically described and empirically identified. Landscapes are a relevant concept in many fields of research, including ecology and cultural geography. What defines them, across those fields, is the physical closeness and connectivity of various elements within their space (Taylor et al. 1993). In a metaphorical value landscape then, values are close to each other in the mental space of an individual or group, and they are strongly connected, i.e. giving importance to one value of a value landscape should go along with prioritising other values of that value landscape, too. In this novel 'value landscapes approach', water governance is in turn defined as the synthesis of water policy (the 'content' of decision-making), water politics (the 'power play' between actors) and water polity (the institutional

framework), inspired by Treib et al.'s (2007) conceptualisation of governance more generally.

The development of a novel conceptual framework on the link between values and water governance represents the main theoretical academic contribution of this PhD thesis. Currently, this link is being investigated by a small number of water ethicists (e.g. Groenfeldt 2013; Liu et al. 2011), cultural and religious scholars (e.g. Amery 2001; Foltz 2002; Gibbs 2010) and interdisciplinary social scientists (e.g. Glenk & Fischer 2010; Hatfield-Dodds et al. 2006/2007; Syme 2014). The proposal to study value landscapes should be seen as an attempt to structure and systematise the investigation of values in water governance making use of various strands of theoretical literature. Furthermore, this research is the first to empirically apply this novel conceptual framework to a concrete case study using multiple methods, which is in itself a contribution to the academic literature.

Empirically identifying these values is not a merely academic undertaking that enhances our understanding of motivations of various actors in water governance. There are also clear implications for the political legitimacy of water governance if we compare the values held by different stakeholders and the public with the values reflected in actual water governance in the area. Depending on the distribution of values identified, much can be said about the political influence and power of various groups of stakeholders. For example, local people's values for traditions and conservation may not match powerful politicians' values for economic growth. Furthermore, the study of various levels of values can contribute to a better understanding of conflicts in water governance, as one can compare the values of different actors in a conflict and compare whether disagreement is located only at the most concrete level of assigned (water) values or whether it extends to the more fundamental principles of governance-related values or even fundamental held values.

Finally, this PhD thesis also contributes to the Brazilian water governance literature, which at present overwhelmingly focuses on the implementation of Brazil's 1997 water law (9.433/1997) and associated reforms towards river basin-level management, the introduction of economic governance instruments, and the creation of river basin committees (see e.g. Abers & Keck 2009, 2013; Campos & Fracalanza 2010; Caramello et al. 2012; Empinotti 2016; Ioris 2009, 2010; Libanio 2014; Martins 2015; OECD 2015; van den Brandeler et al. 2014; Veiga & Magrini 2013; Zago 2007). Previous research on values in water governance in Brazil is very limited, with Ioris' (2011) case study on water values in Rio de Janeiro being one isolated exception, but which takes a different theoretical perspective.

1.3 Research context: The Upper Paraguay River Basin, Mato Grosso, Brazil

The Upper Paraguay River Basin is located in the geographical centre of the South American continent, in the border region of Brazil with Bolivia and Paraguay (see Figure 1.1). Within Brazil, it stretches across the states of Mato Grosso to the north and Mato Grosso do Sul to the south before the Paraguay River crosses Paraguayan territory and joins the Paraná River at the Argentinean-Paraguayan border, which in turn merges with the Uruguay River to form the Río de la Plata. The Paraguay River Basin is part of the greater Plata Basin, one of the major South American river basins that is home to some of the continents' largest population centres, including São Paulo and Buenos Aires. However, the present research focuses on the sparsely populated upstream sections of the river basin that are located inside the state of Mato Grosso. Historically, the Paraguay River was an important navigation route that permitted exploration and settlement of Mato Grosso by Portuguese and Spanish colonisers from the 16th century onwards (Siqueira 2002), and rights over its navigation triggered South

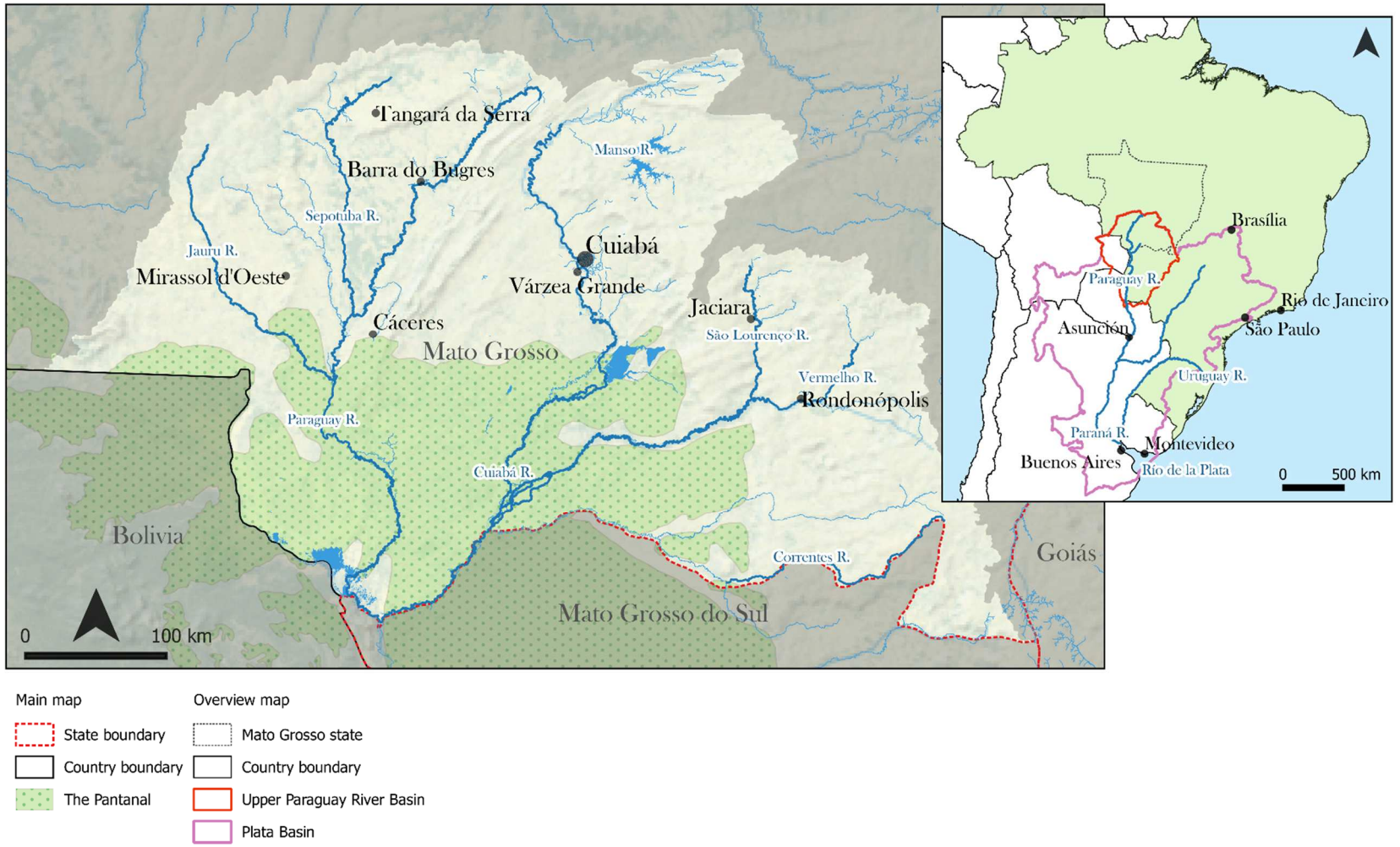

Figure 1.1: The Upper Paraguay River Basin in Mato Grosso, Brazil
(source of city locations, rivers, waterbodies: © OpenStreetMap contributors; Pantanal: Olson et al. 2001)

America's largest war in the 19th century, the so-called Paraguayan War (Bethell 1996).

Nowadays, the Upper Paraguay River Basin has strategic relevance for two main reasons: First, it sustains a large portion of the Pantanal wetland, which is in turn the world's largest freshwater wetland whose global importance has been recognised e.g. by UNESCO (Calheiros et al. 2012; Ioris 2013; Junk et al. 2006). The Pantanal is made up of seasonally inundated floodplains. It serves as an important wildlife refuge for endangered species, including iconic species such as the jaguar, the hyacinth macaw, the giant river otter, the jabiru stork, the giant armadillo, and a large number of caimans and other bird species (Alho & Sabino 2011; de Pinho et al. 2017; Junk et al. 2006) and its biodiversity has been made more widely known to the British public in a recent BBC series presented by David Attenborough (Pope et al. 2017). It is also characterised by particular hydrodynamic phenomena, such as the Pantanal 'flood pulse' (i.e. very high seasonality in water levels) and many avulsive rivers (i.e. rivers that frequently change their course due to high sediment loads) (Assine et al. 2016). These add to the scientific importance of the Pantanal for hydrologists and ecologists. Junk et al. (2014) note that there is an urgent need for conservation, regulation and management policies for Brazilian wetlands, which currently do not exist.

Second, the Upper Paraguay River Basin is situated at the current frontier of the international agribusiness sector, with Mato Grosso being Brazil's most important soybean producer and exporter to world markets, especially China (Ioris 2015; Peine 2013; Richards et al. 2015). This has led to a sustained period of economic growth and immigration from many other parts of Brazil, especially the south (Rausch 2014; Richards et al. 2015), and to the promotion of Mato Grosso under the slogan of 'the Brazil that is doing well' [*o Brasil que dá certo*] (Ioris 2017). Yet, the accumulated wealth is being distributed very unequally (Castro et al. 2002; Ioris 2017) and concerns exist about the associated environmental impacts

of deforestation (Azevedo & Pasquis 2007) and public health impacts of widespread pesticide use (Curvo et al. 2013; Moreira et al. 2012).

On the whole, Mato Grosso and the Upper Paraguay River Basin are an exceptionally water-rich region, although characterised by seasonal variability with marked rainy and dry seasons that have a strong impact on water levels in rivers (SEMA 2009). Some of the major water management challenges that the Upper Paraguay River Basin faces are: the pollution of rivers and absent or deficient urban water supply and sanitation (de Lima et al. 2015; Ioris 2016; Zeilhofer et al. 2010); the implementation of Brazil's water law 9.433/1997 and the associated creation of economic governance instruments, river basin committees, and basin-level management as in the rest of Brazil (Alves et al. 2009; Figueiredo et al. 2012); the environmental impact of tourism and fishing, especially in the Pantanal (Alho & Sabino 2011; Mateus et al. 2011); and hydrological changes caused by major infrastructure projects, including the construction of a large number of hydroelectric power stations (Fantin-Cruz et al. 2015; Zeilhofer & de Moura 2009) and potentially a waterway across the Pantanal (Calheiros et al. 2012; Hamilton 1999; Leão et al. 2013).

This last water governance issue, the construction of the Paraguay-Paraná Waterway, was selected as a case study for the application of the novel conceptual framework developed for this PhD thesis. It is a controversial infrastructure project with a long history of conflict between various stakeholder groups that concern the potential impacts of shipping and major engineering modifications close to its proposed starting point in Cáceres, Mato Grosso, on the hydrology, ecology, and livelihoods of local people in the Pantanal wetland (Bucher & Huszar 1995; Calheiros et al. 2012; Gottgens et al. 2001; Hamilton 1999, 2002; Huszar et al. 1999; Junk & Nunes da Cunha 2005; Leão et al. 2013; Pains da Silva et al. 2004; Schlesinger 2014). It is this history of conflict and disagreement that makes it an especially worthwhile case study for a value landscapes approach

as it allows comparing whether supporters and opponents are guided by different, but coherent value landscapes. It also encapsulates very well the contrast between the Pantanal's relatively intact natural environment and Mato Grosso's economic dependence on the agribusiness sector. The Paraguay-Paraná Waterway is part of a national plan to improve Brazil's inland navigation infrastructure with the objective to facilitate year-round navigation and the export of agricultural products such as soybeans and cotton from Mato Grosso to world markets. If implemented, the waterway would run 3442 km from Cáceres to the port of Nueva Palmira in Uruguay, crossing Paraguayan and Argentinean territory further downstream (ANTAQ 2013). As of 2016, the project has passed a technical, economic, and environmental impact assessment (UFPR/ITTI 2016) and has the support of Mato Grosso's state government (Arévalo 2015), but construction has not yet started, likely due to Brazil's ongoing political and economic crisis.

1.4 Research strategy and methodological approach

The overall PhD research strategy was divided in three separate stages: 1) conceptual and theory-developing stage; 2) exploratory and hypothesis-generating stage; 3) quantitative and hypothesis-testing stage. It began with the development of a novel conceptual framework on the link between values and water governance, also called value landscapes approach referencing its main metaphor. For this purpose, existing literature from a number of disciplinary perspectives on both values and water governance was reviewed to serve as a theoretical foundation for this novel conceptual framework. Furthermore, existing literature on the specific link between values and water governance was reviewed, leading to the formulation of the conceptual framework centred on three main types of values and three elements of water governance as outlined in section 1.2.

The empirical research then followed a two-tiered approach structured around two separate fieldwork stages in the Upper Paraguay River Basin with different

objectives and associated research methods. The first fieldwork stage (October-December 2014) followed an exploratory, qualitative, and bottom-up approach to research and consisted of 24 semi-structured interviews with stakeholders from various water-related sectors in the river basin, as well as some participant observation at water-related events. The main objective was to elicit broad and simultaneously in-depth information about water governance in the area, covering the topics mentioned in the second paragraph of section 1.3 above, to permit analysing it for statements that would link values and water governance, i.e. applying the conceptual framework developed in the first theory- and literature-based stage of the research.

The second fieldwork stage (January-June 2016) had the objective of collecting empirical data that would permit testing hypotheses on the link between values (or value landscapes) and water governance developed during the first conceptual stage of the PhD project and the second stage of exploratory fieldwork. For this purpose, a closed questionnaire with questions on values and preferences in water governance was developed and applied to a large representative sample of the general population in the Upper Paraguay River Basin. As outlined in section 1.2, the rationale here was to not only study which values and guiding principles are important to people living in this area, but also to elicit data that would allow evaluating the democratic and political legitimacy of actually existing water governance projects. This data was subjected to structural equation modelling, which allows testing complex hypotheses that involve relations between multiple latent variables, such as people's values and, on the 'water governance side' of the theory, focussed on the case study of the controversial project of constructing a waterway across the Pantanal wetland in Mato Grosso.

1.5 Ethics and positionality

With regard to research ethics, the principle followed in this PhD thesis was of 'not causing harm or disadvantages to research participants'.[1] It is not always easy to get access to potential interviewees and the absence of voices from Mato Grosso's hydroelectric power sector in the qualitative study is in part due to a significant level of distrust towards social scientists and foreign researchers (a planned interview was cancelled citing legal concerns). What constitutes harm to a research participant, in turn, is often unpredictable (see e.g. Davis 1993 for some excellent anecdotes), so all responses and quotes used for the qualitative analysis in chapter 3 were anonymised, only making reference to the respective sector and to the position of the interviewee as vaguely as possible, even if they insisted that their full name could be used. This is for their own benefit, where they may have potentially voiced a controversial opinion that might not necessarily match with their own organisation's communication guidelines; and it is also for the benefit of future researchers whose prospects of conducting a successful study might be significantly harmed by unethical research practices within the present research project.

With regard to the quantitative survey applied to members of the general public, it was always made clear to respondents that the research was university-affiliated, i.e. that they should not expect any personal benefit from participating and that their participation was fully voluntary in nature. Furthermore, it was clarified to respondents that their answers were confidential and anonymous, before orally confirming their consent to participate in the study, which from a cultural point of view seemed to be the most appropriate strategy. While the provision of benefits might have increased response rates, it was purposely avoided so as not

[1] The empirical research conducted within the PhD project was approved by Dr Nina Morris on behalf of the Ethics Committee of the School of GeoSciences on September 11, 2014.

to harm the chances of future independent researchers to conduct household surveys who may not have the same financial means available.

About my positionality: my own academic background is an undergraduate degree in *Political Science and Public Administration* from the University of Konstanz, as well as a postgraduate degree in *Environment and Development* from the University of Edinburgh, where the MSc programme is strongly influenced by human geography and political ecology. While both study programmes are highly interdisciplinary (social) science degrees, their epistemological approaches differ considerably. The Department of Politics and Public Administration at the University of Konstanz is characterised by a firmly postpositivist[2] epistemological outlook which places greatest emphasis on the solid measurement and empirical testing of clearly defined hypotheses, making use of statistics and advanced software. Several key members of faculty have a background in mathematical modelling or informatics and the university prides itself in having one of the most rigorous social science methods training programmes in Germany. In contrast to that, my experience with staff at the School of GeoSciences at the University of Edinburgh was of interdisciplinary researchers whose concern for environmental conservation, equity, sustainability, and social justice (governance-related values, in fact) had motivated a career switch from various environmental fields to social science research, thus placing greater emphasis on the concrete real-world impact of their own work; and on the political and structural barriers for social change that they soon encountered after leaving their careers e.g. as ecologists behind.

[2] Postpositivism is sometimes understood as any epistemology that is not positivism (e.g. Wyly 2009); here, however, I refer to its use as 'refined positivism', i.e. an epistemology which accepts a researchers' limitations and does not claim to produce knowledge that is effectively an objective truth, but instead aims at describing regular patterns that approximate empirical reality as close as possible and are continuously redeveloped and refined (Creswell 2009).

Both epistemologies clearly have their strengths and weaknesses. While the postpositivist school can possibly claim greater objectivity[3] and may offer clearer guidelines for research and research methods, in its quest for some 'objective truth out there', it often produces such abstract quantitative results that policy implications are overlooked, sometimes even looked down upon as a worthwhile objective of research. As Neblo et al. (2017) note, for example, less than 1% of papers published today in the political science flagship journal *American Political Science Review* contain any policy recommendations, down from about 20% in the 1950s. This points to a clear disconnect between research and policy or at least to an over-cautiousness on part of the researchers.

Political ecologists, with their clear motivations to contribute to greater social justice and environmental conservation, in turn, risk that they are not taken seriously as researchers, since their work could plausibly be expected to suffer from confirmation biases (against 'neoliberal elites', 'commodification', etc.). This was evident during the fieldwork where critical foreign researchers were on occasion dismissed as 'academic playboys' with safe jobs at their universities who wilfully ignored realities on the ground to confirm their pre-conceived political opinions (which could of course also be an easy deflection strategy to allow ignoring uncomfortable research). Another risk is that their approach could foster the creation of disconnected camps of researchers based on political ideology, rather than on disagreement about the objective nature of their research subject. In the long term, a willingness to abandon the ideal of the 'objective researcher' and conduct research from an explicit political perspective may discredit expert input into policy among members of the general public, since by definition it is bound to ignore empirical evidence that runs counter to the researcher's convictions. This risk could not be more topical at the time of writing both in Brazil and the UK (and other countries around the globe), although at present,

[3] A claim many researchers who are not postpositivists would certainly dispute.

dissatisfaction seems to be concentrated on researchers who claim to be objective, but who are not (as opposed to researchers who do not claim to be objective).

The approach followed here aims at being a 'best of both worlds' approach, i.e. it is not only interdisciplinary, but also multi-epistemological; it accepts the intellectual challenge of appealing to both postpositivists and the more politically minded. It especially coincides with Wyly's (2009) proposition that there is no reason to assume that epistemology, methodology, and political views of the researcher are inherently linked. On the one hand, there should be nothing wrong with fundamental science that may not have immediate policy applications and indeed, some of the more abstract parts of this PhD thesis, for example, on the connection between fundamental values and governance-related values may not easily be translated into policy recommendations. 'Understanding the world better' as a research objective that has intrinsic value may sound old-fashioned or naïve to some, but it has guided countless discoveries and should not be forgotten about in the impact-obsessed era that British academia currently finds itself in; neither should it be oppressed by the cynical perspective that all research serves a certain political agenda (unless of course 'advancement of science/knowledge' is seen as a political agenda). The researcher's primary task is to produce evidence, not political opinions, which at best should only come into play during the selection of a research topic, but certainly not during the formulation of results.

On the other hand, where the research on values performed here does have concrete policy implications (e.g. public approval rates for the construction of a waterway) it would be foolish not to mention them, not least considering the fact that the research has been funded by a policy-oriented scholarship programme of the Scottish Government. Furthermore, identifying who benefits and who is disadvantaged politically and economically from a certain policy or governance context, which is one of the preferred research questions among political

ecologists and critical scholars due to its implications for equity and social justice, is a worthwhile approach within the epistemological framework of this PhD thesis. This, because it has high explanatory power in helping the advancement of understanding a situation, and because it can be answered from an (imperfect and limited) objective perspective. With regards to the novel conceptual framework proposed here, it can be seen as a diagnostic instrument that may or may not guide policy-making. Whether this then happens in reality is a different matter, outwith the control of the researcher. For the case of this PhD project, an attempt will be made to disseminate policy-relevant findings among the interviewed stakeholders,[4] as well as local Brazilian media.[5]

1.6 Outline of the PhD thesis structure

Chapter 2 proposes the novel conceptual framework ('value landscapes approach') that was developed within this PhD project, based on a review of various strands of literature on values and water governance. Besides giving an overview of some of the major value debates mentioned in section 1.1 and extracting the three types of values presented in section 1.2, this conceptual chapter also discusses and seeks to clarify the meaning of the concept of water governance, which is sometimes seen as a normative and sometimes as an analytical concept. An abridged version of chapter 2 was published as:

Schulz, C., Martin-Ortega, J., Glenk, K., & Ioris, A.A.R. (2017): The Value Base of Water Governance: A Multi-Disciplinary Perspective, in: *Ecological Economics*, vol. 131: 241-249.

Chapter 3 seeks to apply the conceptual framework outlined in chapter 2 to the concrete case study mentioned earlier, the project of transforming the Paraguay

[4] Section E of the survey applied to members of the general public was specifically designed in view of compiling policy-relevant data, although it was not analysed for this PhD thesis (see appendix B).
[5] Some of the findings have been presented in an interview with 'salvo melhor juízo', a popular Brazilian online podcast, and are due to be broadcast by August 2017.

River in Mato Grosso into an international waterway, which would benefit Mato Grosso's agribusiness sector but has been criticised for its likely environmental impacts on the Pantanal. It uses the qualitative information collected in the first fieldwork stage as its empirical basis and further develops the concept of value landscapes that was suggested as a suitable metaphor to capture the complex relations between various values and their impact on decision-making and preferences in water governance. Specifically, two such value landscapes consisting of a set of assigned and governance-related values are identified among the interviewed stakeholders from water-related sectors that relate either with a tendency to support or to oppose the construction of the Paraguay-Paraná Waterway across the Pantanal in Mato Grosso. This analysis is combined with a comment on the political implications of the empirical findings on values. A shortened version of this chapter was published as:

Schulz, C., Martin-Ortega, J., Ioris, A.A.R., & Glenk, K. (2017): Applying a 'Value Landscapes Approach' to Conflicts in Water Governance: The Case of the Paraguay-Paraná Waterway, in: *Ecological Economics*, vol. 138: 47-55.

Chapter 4 represents the first attempt to empirically measure and test the concept of value landscapes applying a quantitative approach, using structural equation modelling for data analysis. The empirical findings of chapter 3 were incorporated to guide the formulation of hypotheses and relations between various values and preferences in water governance. Again, preferences regarding the construction of the Paraguay-Paraná Waterway are used as a case study. At the time of writing this PhD thesis, it is planned to submit a reduced version of this chapter to an interdisciplinary journal in the field of ecological economics, environmental valuation and governance by June 2017.

Chapter 5 discusses some lessons learnt in the preceding chapters, outlines potential avenues for future research and debates beyond the current thesis, and

ends with some concluding remarks about the research findings of the entire PhD project.

Chapter 2:

The Value Base of Water Governance: A Multi-Disciplinary Perspective

2.1 Introduction

Water governance is being promoted, at least since the 1990s, as a normative concept to improve water resources management globally, with a focus on increased stakeholder engagement, flexibility, and less hierarchical forms of interaction between the state and society (Castro 2007; Hill 2013; UNDP 2004; Walker 2014). At the same time, water governance is subjected to continuous criticism for not being sustainable, equitable, or democratic (Furlong & Bakker 2010; Ioris 2012b; Swyngedouw 2005). Water governance, as well as its criticisms are heavily influenced by value judgments of all the actors involved. This value base, however, usually remains implicit and is rarely investigated (Glenk & Fischer 2010; Groenfeldt & Schmidt 2013). This chapter aims to develop a theoretical foundation for investigating the role of values in water governance processes.

Research on the value base of water governance is complicated by the complexity of water governance and value concepts. This chapter therefore proceeds by discussing various meanings of water governance, before introducing multiple perspectives on values, a term that is of central importance to economists, philosophers, psychologists, political ecologists, and other social scientists. Water governance may refer to a theoretic ideal which prescribes that government organisations should jointly tackle water management issues with stakeholders and civil society, rather than act by themselves in a top-down manner (Castro 2007; UNDP 2004). In the literature, this perspective is known under the headline of "the shift from government to governance" (Walker 2014). Alternatively, water governance describes an analytical approach to researching

water management processes, which is more generally concerned with state-society relations within water management. Values can be understood as guiding principles or abstract goals that people seek to uphold in decision-making (Inglehart 2006; Schwartz 1996). In relation to natural resources, values can also be understood as expressions of the importance and meanings that are assigned to them (Seymour et al. 2010; Jones, Shaw, et al. 2016). In this chapter a new conceptual framework for investigating value-governance relationships is proposed. This value landscapes approach, which is also relevant to other areas of environmental governance, integrates these multiple strands of theory on values and water governance into one interdisciplinary approach.

2.2 Water governance as a normative and analytical concept

There are several competing understandings of the term 'governance' and, consequently, of water governance. Governance may firstly be understood as a *normative* concept, which advocates that government organisations should work with stakeholders and society in political steering processes (Castro 2007; Hill 2013). It represents a 'shift from government to governance' (Fenger & Bekkers 2007), that is, from rigid forms of rule enforcement to more flexible and interactive mechanisms of public engagement and supposedly shared decision-making. It is thus normative with regard to the decision-making process itself, without making any claims about the content of such decisions. This conception of governance has been developed in the context of liberalising state reforms in reaction to persistent criticism of the failures of the previous model of public administration associated with Fordist policies (Ioris 2014) and is therefore opposed to hierarchical forms of interaction between the state and society which are perceived as outdated and inefficient. In the policy arena, governance is a concept often associated with 'Integrated Water Resources Management' and the

Dublin principles, which also place public participation at the heart of the agenda (Benson et al. 2015).

There is considerable overlap with the intrinsically normative term 'good governance', which describes desirable properties of governance systems, such as strong public participation and consultation, efficiency, transparency, the absence of corruption, accountability, legitimacy, justice, and the rule of law (Ingram 2011; Tortajada 2010). Both governance and good governance are being promoted by international organisations in the water context, e.g. the OECD water governance initiative (Akhmouch & Correia 2016), and the principles of participation and economic efficiency are embedded e.g. in the EU water framework directive (Kaika 2003) or Brazil's 1997 federal water law (9.433/1997) (Veiga & Magrini 2013).

Governance may alternatively be understood as an *analytical* concept, generally concerned with the relationship between state intervention and societal autonomy in political steering processes (Héritier 2002) to understand public decision-making processes. Several different modes of governance have been discussed in the literature, ranging from hierarchical modes to networks and market mechanisms (Schneider 2005; Thorelli 1986). These modes differ with regard to the level of state intervention versus societal autonomy, with market-based governance being the most autonomous and decentralised form of governance. An analytical understanding of governance is widespread in political science (see e.g. Knill & Lenschow 2005). Governance has three different dimensions: polity, politics, and policy, i.e. institutional aspects, power relations between political actors, and the mechanisms and instruments used to achieve certain outcomes (Treib et al. 2007).

It is important to be aware whether an analytical or a normative perspective is applied. For example, the normative understanding of governance is conceptually

close to the network mode of governance, given that networks are seen as a form of joint decision-making among public and societal actors (Schneider 2005). While a normative stance on governance would advocate that governance should be characterised by joint decision-making, applying an analytical perspective would imply describing and analysing patterns of joint decision-making without commenting on their desirability.

In human geography, political ecology, and related disciplines, environmental governance and water governance have been frequently criticised because in their normative conception they contain highly simplistic, utilitarian claims about the expected benefits and alleged advantages (Ioris 2014; Swyngedouw 2005). While acknowledging that state reforms have created novel institutional arrangements within which political decision-making processes are performed, some scholars criticise a democratic deficit of these 'new' forms of governance, despite the fact that they are supposed to achieve greater inclusiveness and empowerment (Fenger & Bekkers 2007; Swyngedouw 2005; Zwarteveen & Boelens 2014). Given the absence of well-established rules on participation in a society with marked asymmetries (Hajer 2003), state actors may cooperate disproportionately with stakeholders who are more favourable towards government policy anyway. From this perspective, governance is thus perceived merely as an array of new 'technologies of government' that is part of the conservative modernisation of the state apparatus (Ioris 2014; Swyngedouw 2005).

Furthermore, much criticism is directed to cases in which particular governance arrangements have been used to exclude parts of society from public services, such as urban water supply, creating social injustice (Mustafa & Reeder 2009; Zwarteveen & Boelens 2014). Case studies have been conducted from a political ecology perspective for example in Lima (Ioris 2012b) or Mumbai (Anand 2011). Ioris (2012b) claims that water scarcity is artificially created and preserved by political elites using neoliberal water governance reforms, with the intention to

perpetuate social inequality. In the case of Mumbai, its municipal water corporation has been allegedly systematically discriminating against Muslim settlers by providing only unreliable water supply to their settlements. Both cases highlight the political dimensions of water governance and how conflicts and injustices may persist despite institutional reforms. For political ecologists, water governance is rarely simply a set of neutral and objective tools.

Finally, neoliberal water governance as one common type of water governance has been attacked for its failure to produce socially and environmentally sustainable outcomes, often within a broader critique of neoliberalism, and the associated impacts of privatisation. Furlong and Bakker (2010), for example, found that neoliberal reforms within Canadian municipal water utilities seeking to increase the distance between government and management may reduce incentives to work towards social and environmental goals. However, they argue that conventional government-led service delivery may face other trade-offs, and thus call for "strategic (rather than ideological) improvements in governance" (ibid.: 349).

In many cases, critics of water governance may not offer any resolution of the problems raised, especially if water governance is criticised on very fundamental, philosophical terms (e.g. Bustamante et al. 2012). The normative work of authors who focus on political aspects of water governance, e.g. citing a lack of democracy or equity, can be interpreted as part of a political and ideological struggle against the foundations of the dominant international water governance agenda, which in their opinion represents the interests of small political and economic elites in charge of water management reforms.

The normative defence of water governance and criticisms of particular water governance arrangements, such as neoliberal water governance, have something in common: they are both based on values. Values are sometimes listed explicitly

as properties of 'good governance' (see e.g. Tortajada 2010), but are mostly left implicit. Where authors criticise a democratic deficit, for example, they may be appealing to values such as social justice, transparency, fairness, equity, etc. The recurrent criticisms of neoliberal reforms in water governance do not stem from a general opposition to needed political and economic reforms, but should be interpreted as value conflicts; neoliberalism may violate values of equity for the sake of efficiency, for example. Or in more applied terms, cultural or ecological values of water may be sacrificed for economic values, for example where a river is straightened to facilitate navigation to support economic development, with detrimental impacts on river ecology and traditional livelihoods.

2.3 Values – A multi-disciplinary perspective

This section seeks to shed light on and bridge competing understandings of the term 'value' with a heuristic discussion from different perspectives. It introduces understandings of value and their interrelations across a very diverse set of disciplines and discusses approaches towards the measurement and analysis of values. It would be beyond the scope of this PhD thesis to discuss every discipline that deals with values (e.g. anthropology) and an inclusion of other disciplines is left for further consideration in the future. At this point, the review focuses on the following four disciplines: environmental and ecological economics, whose concepts are pervasive in environmental governance more generally; philosophy, which has the longest history of discussing values and provides the foundations for all other disciplines; psychology, whose understanding of values is highly relevant for decision-making and has significant overlap with sociology and political science; and geography, including political ecology, which covers human-environment interactions, a core component of water governance.

2.3.1 Economics

Within economics, the link between water values and governance is commonly addressed by the sub-discipline of environmental economics. Environmental economics is rooted in neoclassical economics, which has evolved into the mainstream school of economic thought today (e.g. Mankiw & Taylor 2006). It is based on a conceptualisation of human beings as rational actors that aim to satisfy their substitutable preferences and make choices in a way that would maximise their utility, considering costs and benefits as well as uncertainties associated with every possible action (Dietz et al. 2005; Pearce & Turner 1990). Welfare economics, which deals with allocation decisions affecting human well-being, assumes that such rational behaviour produces the best outcomes in terms of efficient resource allocation (Pearce & Turner 1990). Welfare or human well-being is defined as the satisfaction of individuals' preferences, as long as these are not immoral or illegal, ideally through market exchanges. Preferences are considered as given and the analysis of their origin is usually beyond the scope of economics (Turner et al. 1994).

Social welfare optimisation requires resources to be allocated both efficiently and equitably (Bateman et al. 2002). Government intervention may be justified if markets alone do not produce optimal outcomes for society. Market failures may occur under certain conditions, and collective choice or government intervention may correct these failures (Mankiw & Taylor 2006). To determine how resources should best be allocated, environmental economists estimate changes in human well-being associated with environmental change. Policies or programmes should be pursued if they enhance social welfare, understood as the sum of individual welfare changes (O'Neill et al. 2008). In this context, economic value is then defined as "the change in human wellbeing arising from the provision of [an environmental] good or service" (Bateman et al. 2002: 1), i.e., not the good or service itself is valued. To be able to compare these welfare changes in a single

measurement unit within cost-benefit-analyses, monetary valuation techniques are commonly used to ascribe exchange values to environmental goods and services (Birol & Koundouri 2008; Hanley et al. 1998). These are sometimes classified as use values and non-use values (such as 'existence values', the satisfaction one derives from knowing that for example blue whales exist), then added up to measure the 'total economic value' of an environmental resource (Bateman et al. 2002; Croitoru et al. 2016). Exchange values are determined by individual preferences and the extent to which individuals are willing to trade off scarce means (i.e. usually money) to obtain an environmental change, for example an improvement in environmental quality. Although ways to consider distributional impacts within cost-benefit analysis exist, in practice they are rarely applied (Dehnhardt 2014).

Ecological economics has been established as an alternative school of thought that addresses environmental values and governance not necessarily in relation to exchange value. Combining insights from economics, ecology and other disciplines, ecological economics shares some of its methods with environmental economics, but differs in its underlying paradigm, i.e. the economy is perceived as a subsystem of the wider ecosphere and connected to the balance of energy and the exhaustion of biotic resources (Gómez-Baggethun et al. 2010). It also places greater emphasis on the social impacts of environmental governance. More importantly, however, ecological economics has tried to incorporate a multiplicity of value standards, as opposed to the single value of human wellbeing as in environmental economics (Martinez-Alier et al. 1998). Ecological values, economic values, aesthetic values and other values of the environment are each considered a value standard in their own right. Apart from using predominantly money as a unit of measurement of value, ecological economics also works with bio-physical indicators to determine environmental sustainability (Martinez-Alier 2002). In philosophical terms, this represents a shift from value monism (human

wellbeing as a single ultimate value, usually measured in monetary terms) to value pluralism. Value pluralists argue that there is a variety of basic values, which cannot be converted into each other or ranked according to an ultimate principle, i.e. values are incommensurable (O'Neill et al. 2008).

2.3.2 Philosophy

In philosophy, the study of values is known as 'axiology', which in turn comprises the fields of ethics and aesthetics. Environmental aesthetics deals with the sensory perception of landscapes and other environments and the qualities ascribed to these (Brady 2003). For environmental ethics, one of the principal considerations is the notion of an 'intrinsic value' of the environment as a basis for environmental protection, which is commonly opposed to an 'instrumental value' for human well-being (which is key for environmental economics, as discussed above) (O'Neill et al. 2008). Intrinsic value is present when "the referent entity is an end in itself, such that the value is autonomous and independent of any other entity" (Lockwood 1999: 382).

Some philosophers argue that ascribing intrinsic values is a way of claiming that it makes sense to care about certain things. Thus, the concept is seen as central for environmental ethics and may help people to understand why and how they should care about the environment (McShane 2007). However, other philosophers argue that the concept of an intrinsic value of the environment should be discarded. They state that all values are inherently relational and, ultimately, decided by humans (Morito 2003); or, from a pragmatic and empirical perspective, that the concept is unhelpful in motivating people to protect the environment (Light 2002).

It is important to point out that there are several possible interpretations of 'intrinsic value' that sometimes, but not necessarily overlap. O'Neill (1992)

distinguishes at least three types. First, intrinsic value may be a synonym of 'non-instrumental value', i.e., something has value for its own sake. With regard to the environment this claim has recently been made for example by ecosocialists (Kovel 2014), conservationists (McCauley 2006; Vucetich et al. 2015) and earlier by deep ecologists (Næss 1984). Second, intrinsic value may refer to an object that has intrinsic properties, i.e., properties of a 'non-relational' nature that reside in an object. Third, intrinsic value may refer to some sort of 'objective value', i.e., value is present independent of human valuers, although this claim is often rejected and sometimes used to discredit the concept of an intrinsic value of the environment altogether (Morito 2003). In environmental and ecological economics, intrinsic value usually refers to the first type, which has also been denoted as 'end value' (Lockwood 1997).

There are also varying definitions of what intrinsic value should extend to, i.e. which objects constitute 'the environment' that may or may not be bearers of intrinsic value (Lockwood 1999; Vucetich et al. 2015). McDonald (2004) summarises this debate stating that philosophers differ in their degree of radicalism. Some may ascribe intrinsic value only to higher animals, or to all living beings, or even to non-living beings. They also differ in the sense that some ascribe intrinsic value to individuals, while others have a more holistic perspective and ascribe intrinsic value to the survival of a species or ecosystem. Ecocentrism refers to the notion that ecological collectives, such as ecosystems, populations, and species are bearers of intrinsic value, while in biocentrism all living things bear intrinsic value (Vucetich et al. 2015).

The philosophical debate of intrinsic values can also help us to understand and criticise the concept of ecosystem services, which has become a common way to frame properties of the environment in academic publications and policy documents alike (e.g. Gómez-Baggethun et al. 2010; MA 2005; Martin-Ortega, Ferrier, & Gordon 2015; Watson & Albon et al. 2011). It is equivalent to stressing

the instrumental value of the environment to humans. Ecosystem services have been defined as "the benefits people obtain from ecosystems" (MA 2005: 53). While the classification of ecosystem services into supporting, provisioning, regulating, and cultural services is a broad interdisciplinary undertaking with an origin in ecology, the definition of the concept of ecosystem services is fundamentally a question of environmental ethics, since it favours an anthropocentric approach over biocentric and ecocentric approaches. The division of benefits of the environment into different ecosystem services also raises philosophical questions on the incommensurability of multiple types of value as outlined in the brief overview on ecological economics in the previous section. Especially cultural values are characterised by incommensurability and intangibility and are thus often left out in economic valuations, leaving researchers calling for alternative value measurement techniques (Chan et al. 2012).

Davidson (2013) argues that intrinsic values of nature cannot be integrated into an ecosystem services framework, even though attempts have been made to classify them as 'cultural ecosystem services' (Chan et al. 2012; Gee & Burkhard 2010). However, under certain conditions economic valuation techniques could be able to capture both intrinsic and instrumental values (Davidson 2013). To explain this argument, it is necessary to introduce another broad discussion in (environmental) ethics, that is, whether in assessing morality in decision-making, the focus should be on the means to an end (deontological ethics), or on the end itself (consequentialism), regardless of the means (O'Neill et al. 2008).

Following a consequentialist ethic, placing economic values on the environment is acceptable and may serve to enhance both instrumental and intrinsic values of nature.[6] What matters is the end, i.e., either improved human well-being through conservation or improved well-being of the non-human world, which could both

[6] Zimmermann (2014) describes examples of non-instrumental and non-intrinsic values, but this discussion is considered to be beyond the scope of this review.

be bearers of intrinsic value. Deontologists, in turn, reject economic valuation as it appears to be an unacceptable means to achieve environmental conservation, given that animals, plants and species are seen as ends in themselves and can thus not be used as means for economic purposes (Davidson 2013). This line of thought is also often voiced in environmental activism, using slogans, such as "*water is not a commodity*" or "*our climate is not for sale*" (Kallis et al. 2013: 97).

While ethics as the larger field within axiology deals with moral questions of right and wrong, aesthetics as the smaller field in the study of values in philosophy is concerned with the sensory perception of objects (Brady 2003). In environmental aesthetics, the term 'aesthetic value' is used to "describe the qualities ascribed to landscape, seascapes and other environments" (ibid.: 20). There are several competing theories about whether aesthetic values can be determined objectively or whether they are purely subjective. Some philosophers make use of existing theories about the perception of art, adapting them to claim that 'objective' aesthetic values of the natural environment derive from knowledge about it (Carlson 2004). From this follows that ecologists and geologists should be 'true experts' about environmental aesthetics and that science provides guidelines about aesthetic values (Saito 2004).

Other philosophers have also criticised the common sense view of aesthetic values as purely subjective as is commonly expressed in the phrase: '*Beauty lies in the eyes of the beholder*', which may wrongly lead to the conclusion that aesthetic values do not matter for public policy (Brady 2006). However, Brady disagrees with a purely objective approach towards aesthetics, too, and has thus tried to integrate objective and subjective approaches within a single framework. She argues that individual value judgements should possess 'intersubjective validity', i.e., it should be possible to defend them providing a reasonable justification (Brady 2003). Sibley (2001: 75) compares aesthetic properties with colours, stating that "the ultimate kind of proof [...] consists in a certain kind of

appeal to agreement in reaction or discrimination." Their objectivity thus arises out of a convergence of judgements between different people, which may occur over time.

Generally, it appears that most axiologists have an affinity towards deliberation as a tool to 'measure' values, including both aesthetic and moral values. Such deliberation may include experts and non-experts in a given field or location (Brady 2003). From a logical point of view, deliberation as a method is important, since practical conflicts about values cannot be resolved by resorting to 'higher-order values' or general principles as these may face the same problem. Moreover, values can often not easily be separated from each other and scoring high on one value scale could be problematic in the wrong context (O'Neill 1993). Efficiency, for example, could be seen as undesirable if characterising a process of natural destruction.

2.3.3 Psychology

Values are important in social psychology and environmental psychology. There is also significant overlap with sociology and political science (Dietz et al. 2005). 'Value' in psychology generally refers to 'held values' (Lockwood 1999), defined as "desirable, transsituational goals, varying in importance, that serve as guiding principles in people's lives" (Schwartz 1996: 2). As such, held values may influence preferences or attitudes, which in turn determine how people assign value to certain objects or settings (Brown 1984).

Many psychologists and sociologists thus view values as independent variables that have some causal effect on people's preferences and on individual valuation processes (Hitlin & Piliavin 2004; Rokeach 1973; Steg et al. 2014). Over time, this simple model has been refined. One such example is Stern et al.'s (1999) 'Value-Belief-Norm Theory' of social movement support, applied to

environmental activism. In this model, values determine environmentally friendly behaviour, mediated by beliefs and norms.

Another theory widely applied to explain environmentally friendly behaviour is the 'Theory of Planned Behaviour' (Ajzen 1991). An individual's behaviour is closely determined by his/her intentions. These intentions, in turn, are determined by attitudes towards the behaviour, subjective norms and perceived behavioural control. While values are not an element of the original theoretical model, it has sometimes been adapted to include them (see e.g. De Groot & Steg 2007). Moreover, one could assume that subjective norms are a consequence of personal values as in the Value-Belief-Norm Theory. This appears to be a matter of how 'deep' one wants to trace causal chains of people's behaviour in their personality. As values are situated at a more fundamental level, they have less predictive power than behavioural intentions.

Two observations are pertinent here. Firstly, there is a broad variety of interrelated concepts in psychology that may easily be confused and pose serious challenges for empirical research. Dietz et al. (2005) list 'values', 'attitudes', 'traits', 'norms', 'needs', 'preferences', 'beliefs', 'worldviews' and 'roles'. It would be beyond the scope of this review to discuss all of these concepts here. Most importantly, values express desirable states, as opposed to cognitive understandings of facts and states (which are captured by beliefs and worldviews). Furthermore, values are located at a rather fundamental and abstract level (unlike attitudes and preferences) and are thus comparatively stable, i.e. they do not change easily and have an impact across many different situations. As such, they appear to be a highly relevant concept to understand and inform the design of governance and policy instruments (Steg & Vlek 2009).

Secondly, empirical research in environmental psychology often aims at explaining environmentally-friendly behaviour through a causal chain or cognitive

hierarchy from values to attitudes and behaviour (Fulton et al. 1996; Homer & Kahle 1988; Ives & Kendal 2014). According to the most recent literature, there are four types of values that determine environmentally relevant beliefs, preferences, and actions, namely 'hedonic', 'egoistic', 'altruistic', and 'biospheric' values (Steg et al. 2014). Correlations between certain value clusters and behavioural patterns, beliefs or preferences are investigated. The social psychologist Shalom Schwartz developed the 'Theory of Integrated Value Systems' (Schwartz 1992, 1996). It assumes that individuals adhere to different value systems that are composed of ten individual values organised in a circular structure according to two basic dimensions ('openness to change' vs. 'conservation' and 'self-enhancement' vs. 'self-transcendence'), although he later clarified that a classification of the individual values into other basic dimensions is possible (Schwartz & Boehnke 2004). Schwartz (1996) states that values only affect individual behaviour when a decision causes a conflict between values and a trade-off is required, i.e., multiple values cannot be addressed simultaneously.

The strong empirical focus within psychology means that measurement techniques have developed over a long time. Several standardised tools are readily available that measure, for example, the ten values of the Theory of Integrated Value Systems with 56 survey items (Schwartz 1992) or the four dimensions or value clusters of the same theory with 12 survey items (Stern et al. 1998). Environmental psychology tends to have a strong tendency towards quantitative methods (e.g. Milfont & Gouveia 2006; Schultz et al. 2005; Steg & Vlek 2009); and its concern with the statistical validation of certain measurement tools appears to be rooted in a postpositivist epistemology (Creswell 2009).

2.3.4 Human geography and political ecology

Values are not a key concept in human geography. However, a long tradition of studying human-environment interactions in human geography justifies taking

geographical literature on values into account. The most distinguishing feature is probably the emphasis on the historical and geographical specificities of values (Brandenburg & Carroll 1995; Cheng et al. 2003; Ioris 2011; Stephenson 2008; Humphreys Bebbington 2013; Upton 2014). Sr. Buttimer (1974), for example, in a review of "values in geography", mentions that definitions of value may differ within different cultures. Ioris (2012a: 143), in turn, defines values as "contingent assessments that emerge out of socio-ecological relations and reflect particular demands, legacies and opportunities", lining human geography in the list of disciplines that deal with assigned values, rather than held values. He also introduces the concept of 'water value positionality', which is to be understood as a combination of the different meanings or use values of water (including more abstract uses, such as religious meanings), expressed by different stakeholder groups in a specific time and location (Ioris 2011).

Both concepts ('positionalities' and 'values') are highly adaptable to local contexts, open and flexible. In fact, Ioris (ibid.) argues that values should be defined according to concrete experiences and actual reality, rather than according to preconceived theoretical constructs, such as ecosystem services. Furthermore, geographers place a strong emphasis on the multi-dimensionality of values, which may be material, symbolic, socio-economic, etc. Therefore, they are often very critical of monetary valuation and tend to follow philosophers in the idea that there are inherent or intrinsic values in nature (Harvey 1996). Studying cultural values of landscapes, Stephenson (2008) proposes that these are dynamic interactions between forms (such as the existence of a river), practices (such as fishing) and relationships (such as the aesthetic appreciation of a landscape), encompassing both human and non-human dimensions, as well as their present and history. Many geographers also draw attention to the fact that valuation processes are often highly politicised, i.e., they represent a struggle between different groups of society (Ioris 2012a; Upton 2014).

This is also one of the central claims of political ecology, which is significantly rooted in human geography (Kallis et al. 2013) and in fact it is sometimes not clear how to delimit boundaries between the two fields. Political ecology can have an important role in analysing valuation conflicts. Where different actors disagree on environmental values and valuation methods, it is a political decision which values will be given priority (Bryant 1998; Humphreys Bebbington 2013; Upton 2014).

Another common approach to values in human geography and political ecology consists in a critique of contemporary environmental governance by pointing out the focus on exchange values of nature as opposed to use values, following classical economics and Marxist theory (see e.g. Robertson & Wainwright 2013). Unlike use values, exchange values are typically expressed in monetary terms and are not necessarily indicators of the concrete usefulness of an object or product (Kallis et al. 2013). The prioritisation of exchange values is considered to be a result of processes of 'commodification' or the creation of new markets in areas that were previously non-marketed (Gómez-Baggethun & Ruiz-Pérez 2011). However, the narrow focus on exchange values and use values only is sometimes criticised as too limited (Ioris 2011); in response, eco-socialist Kovel (2014) suggested expanding this classical economics dichotomy by including intrinsic values of nature as a third category. This of course ignores that other disciplines have already developed much more sophisticated value typologies (as outlined e.g. in section 2.3.1 on values in environmental and ecological economics). Ideological differences between eco-socialists and more mainstream economists may possibly explain the lack of intellectual engagement with each other's work.

2.4 Implications for water governance

Governance implications and some key criticisms of each discipline's perspective on values will be outlined here to complement the review in the preceding

sections and to further investigate potential links between the various theoretical conceptualisations of value and their meanings for water governance.

The main governance implication of an economic approach towards value would be the widespread adoption of economic valuation techniques to inform cost-benefit analyses (CBA). These would support water management decisions under the principle of 'efficiency', understood as the maximisation of social benefits in terms of welfare measured in monetary units. This could be coupled with a philosophical shift towards the ecosystem services paradigm as a basis for environmental governance in general, given that this paradigm has been developed to link ecosystems with human welfare, which in turn is the ultimate value in environmental economics (Fisher et al. 2008).

While monetary valuation is often advocated for because of its potential to feed into CBA, its results in fact so far have not had much impact on decision-making in environmental (and water) governance, as shown in several studies (e.g. Rogers et al. 2015 in Australia, Dehnhardt 2014 in Germany). Thus, it seems likely that a divergence between economic theory and practice will continue to exist in water governance, i.e. the actual impact of economic theory is much more limited than one could assume. It should be noted, however, that the EU has significantly changed its approach to water management by introducing an economic efficiency principle in its Water Framework Directive (Martin-Ortega 2012), which may enhance the influence of economic valuation and environmental CBA at least in EU countries. Moreover, the introduction of the ecosystem service paradigm into the policy sector is well under way, as shown e.g. by Grizzetti, Liquete, et al. (2016).

Secondly, taking the recommendations of environmental philosophers seriously, governance should incorporate more deliberative institutions, i.e. forums where qualitative dialogue can assist in public decision-making, so that a multiplicity of

value standards can be taken into account (O'Neill & Spash 2000). For environmental governance, citizens' juries, consensus conferences, and deliberative polls have been suggested as alternatives to economic valuation methods (ibid.), while in water governance, river basin committees are probably closest to this theoretic ideal (van den Brandeler et al. 2014). As Martin-Ortega, Perni, et al. (2015) show in a Scottish case study on the implementation of the EU Water Framework Directive, including the perspectives of multiple stakeholders in governance processes may place additional demands and require further resources towards the management of an already complicated issue, making an already steep learning curve even more demanding for water managers. This also depends on whether stakeholder involvement is consultative or truly participatory (Lang et al. 2012).

In practice, deliberative institutions generally are fraught with difficulties, too. For example, it may be very challenging to convey possibly complex information on an environmental issue in a sufficiently neutral and objective way for the purposes of a citizens' jury, so as to avoid influencing opinions by framing the issue at hand in a certain way (Kenyon et al. 2001). Another major problem of deliberative institutions is the fact that they are far from being the rational and democratic forums where equal partners debate governance issues as some of the theoretical literature might suggest. Dynamics of power and emotions among participants have a significant impact on deliberative processes and any outcomes of such forums are shaped and mediated by these (van Stokkom 2005). In other cases, powerful (state) actors may simply bypass deliberative institutions, as has happened in the case of the Brazilian municipality of Guarulhos, where major infrastructural projects, such as the construction of a dyke, were initiated without any involvement of the local river basin committee (van den Brandeler et al. 2014), so it can be doubted that multiple values of different stakeholder groups

were taken into account in the way environmental philosophers would recommend it.

Thirdly, taking the psychological understanding of values as a guideline, governance should aim at activating and enhancing those held values which are deemed to be desirable, taking into account moral considerations. In the context of water governance, these values could, for example, fall into the categories of 'self-transcendence' and, more specifically, 'universalism', i.e. a desire to protect the welfare of all people and nature (Schwartz 1996), although in principle all other values could also be related to water governance in one way or another. This insight is being studied in the context of environmental campaigns (Bolderdijk et al. 2012) and has been applied by major charity organisations (Crompton 2010). Often, a change in environmental values is seen as a long-term solution to environmental governance issues (e.g. Liu et al. 2011), although it usually remains unconnected to concrete measures.

Generally, environmental psychology still contributes very little to the study of environmental governance, although Steg and Vlek (2009) believe that this discipline could often inform and improve policy-making by explicitly considering behavioural consequences of policy instruments. These may be classified as 'structural', where decision-making contexts are modified or 'informational', where communication and education are used to persuade people to change their behaviour. Another option is to improve governance by studying the acceptance and preferences for certain policy instruments among the public, depending on held values (e.g. Glenk & Fischer 2010).

Finally, given the emphasis on historical and geographical specificities, a geographical understanding of values should imply that water governance follows the subsidiarity principle, even though this principle is more commonly associated with economic theories that stress the benefits of decentralisation

(Garrick et al. 2012). It requires that governance tasks should be carried out at the lowest level possible (Marshall 2008). Compared to such economic theories, however, human geography and political ecology would pay much more attention to issues of social justice and the political dimensions of governance as opposed to the polity dimension, as outlined above in the overview on water governance. Naturally, human geographers have also started mapping spatial patterns of environmental values, which may serve to understand multiple dimensions of value among different stakeholder groups beyond mere economic values (Sherrouse et al. 2011). Maps are also critical to environmental zoning, which in itself is an important tool in water governance that helps to determine land use decisions. Such zoning exercises are often highly political and reflect the preferences and values of powerful social groups (Boschet & Rambonilaza 2015).

2.5 Linking values and water governance – a conceptual framework

The central argument of this chapter is that studying values enhances the understanding of water governance, and vice versa: water governance can reveal something about the values of actors involved. As discussed above, there is a diverse literature and contrasting epistemology of both values and governance with strong implications for water governance. However, studies concerned with linking these fields are less common. Amongst these are studies trying to understand the effect of religious values on water governance, for example in water-scarce Islamic countries, where religion, law, and governance are often closely related (see e.g. Amery 2001; Foltz 2002). Water ethics is another field that deals with the connection between values and water governance (Groenfeldt 2013; Groenfeldt & Schmidt 2013). Ethical principles that have been identified may serve as guidance in water governance (e.g. Liu et al. 2011).

Political ecologists routinely connect values and governance, but their work is focused heavily on a critique of capitalism and is thus mostly concerned with

issues of social justice and equity, rather than values in general (e.g. Kallis et al. 2013; Zwarteveen & Boelens 2014). Finally, many ecological economists are very aware of the plurality of value standards and related 'languages of valuation' (Martinez-Alier 2002). Yet, the concept of languages of valuation is very fuzzy and stands for many different things, including institutions, values, cultural traditions, and valuation methods. Multi-criteria analyses are often used in case studies that aim at incorporating multiple values into water governance (e.g. Munda 2004; Scolobig et al. 2008). Such multi-criteria evaluations are usually designed to inform concrete policy decisions and focus on different values of the environment or ecosystem services, rather than personal or social values as understood in psychology.

Finally, there are also a number of studies which investigate the link between values and water governance from an interdisciplinary perspective. Glenk and Fischer (2010) combined insights from social psychology and environmental economics to study preferences for certain water management strategies among the Scottish public, which are in a cognitive hierarchy model related back to fundamental values such as 'self-transcendence/conservation' and 'self-enhancement', but also governance-related values such as 'sustainability', 'solidarity', and 'efficiency'. Several Australian researchers have explored the implications of indigenous water values for water governance and how these may or may not be compatible with 'Western' notions of water values and water management, e.g. focusing on water variability (Gibbs 2010), water markets (Nikolakis et al. 2013) or social justice (Jackson & Barber 2013). Further interdisciplinary research has tried to understand the role of social values in the context of uncertainty and long-term planning in water management (Syme 2014) as well as for risk management (Daniell et al. 2008). Finally, Syme and Hatfield-Dodds (2007) reviewed how understanding and engaging the public's values may improve water management, discussing both values attached to water

(environmental, social, economic values) as well as values related to governance itself (fairness, equity).

Any water governance issue, but especially conflicts around water governance can be interpreted as conflicts of values between different stakeholders. In Glenk and Fischer's (2010) case study, members of the public who valued solidarity also had a stronger preference for a council insurance as a measure of coping with a climate-change-induced increase in flood risk that spreads the financial burden across society. Other water governance issues, such as dam building, pollution, water charges, fishing, are conceivably equally characterised by the value systems of stakeholders involved in these issues. The idea of studying values to understand governance is not new. However, while some studies are conducted from a monodisciplinary theoretical base (see e.g. Hermans, Kadigi, et al. 2006, for a study which explains conflicts in terms of economic values of water or Groenfeldt & Schmidt 2013, for a perspective from ethics), others have a very broad and inclusive understanding that would benefit from some systematisation. Presenting the general public's thinking on water values and attitudes around water, Hatfield-Dodds et al. (2006/2007: 46) for example suggest that: "[t]here is a strong element of public good thinking, acknowledgement of environmental rights, and support for the efficient use of water for Australia's overall wellbeing" thus including very different value concepts such as efficiency or environmental values of water.

The first step in value-based studies of governance should be to clarify the understanding of values. It should be especially fruitful to take an interdisciplinary perspective, i.e. integrating theory and methods from multiple disciplines and crossing boundaries between these (Tress et al. 2004). In some cases, epistemological differences may pose barriers to an interdisciplinary dialogue, e.g. between human geographers and environmental psychologists, but eventually it is a choice of the individual researcher to either overcome these or risk ignoring information relevant to a comprehensive investigation of real-world issues. Water

governance is an ideal field to study different dimensions of value, because it inherently requires dealing with competing opinions and perspectives (Boelens et al. 2016). Investigations are not only of academic interest. Liu et al. (2011), for example, suggest that a transformation of human water ethics and related values may be a more efficient solution to water governance problems than regulation.

The following paragraphs present a new conceptual framework that could serve as a theoretical foundation for the analysis of the multiple links between values and water governance (Figure 2.1). The different components of the framework are introduced first, followed by a characterisation of the relationships between these.

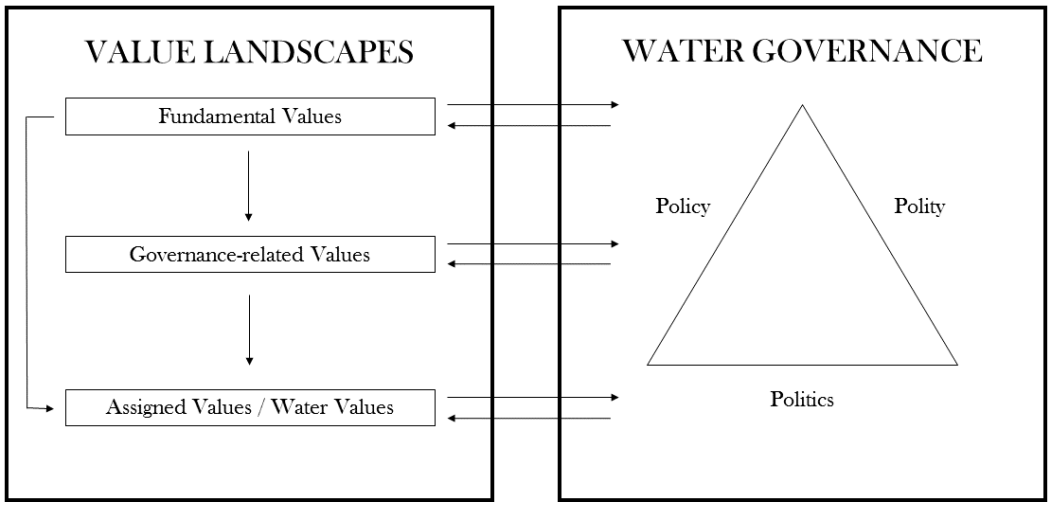

Figure 2.1: Value landscapes and water governance: a conceptual framework

The framework considers water governance from an analytical perspective as described at the beginning of this chapter as being composed of the elements of politics, policy and polity (following Treib et al. 2007). These elements of water governance are related with three different value categories distilled from the previously discussed disciplines that are then subsumed under the headline 'value landscapes', which is a metaphor that represents groups or clusters of values that

are typically related, as e.g. Jones, Ross, et al. (2016) note that values rarely appear in isolation in people's minds. According to Taylor et al. (1993), (ecologically defined) landscapes are characterised by their physiognomy, composition, and connectivity, i.e. the fact that various elements are physically close to each other, and facilitate easy movement between them.[7] Value landscapes, in this sense, would be characterised by values which are 'physically close' in the mental space of an individual or group; and the assumption is that prioritising one value in a value landscape goes along with prioritising its other values, too, i.e. there is high connectivity between them.

The concept of fundamental values has its origin in social psychological theory and is generally defined as abstract goals and principles that guide people's decision-making across situations (Fulton et al. 1996; Rokeach 1973; Schwartz 1992; Schwartz et al. 2012). The concept has been tested and applied in countless studies, for example to predict environmental attitudes of research participants through values (e.g. Milfont & Gouveia 2006) or to understand public preferences for climate change and flood risk mitigation policies (Glenk & Fischer 2010). As noted earlier, one of the most popular theoretical frameworks for fundamental values is Schwartz' theory of basic human values (Schwartz 1992; Schwartz et al. 2012), which in its original form proposed the existence of 10 basic values that are universally recognised among humans across cultures,[8] only varying in the relative importance given to them by different people in different situations. According to this theory, fundamental values are especially relevant in situations of value conflict, i.e. where two alternative choices would reinforce different or opposing values. Alternative frameworks that have a similar understanding of

[7] It should be noted that there is an abundant variety of definitions of the term 'landscape' in geography (see Stephenson 2008 for an overview), however, the ecological focus on connectivity as a defining element was judged to be most relevant for the purposes of this conceptual framework.

[8] These are universalism, benevolence, conformity, tradition, security, achievement, power, hedonism, stimulation, and self-determination, arranged in a circular structure that can be subsumed under two broad pairs of opposing higher-order dimensions (self-enhancement vs. self-transcendence and openness to change vs. conservation).

values have been developed e.g. in the context of the World Values Survey which gives a central position to the contrast between survival values and self-expression values as well as between traditional values and secular-rational values (Inglehart 2006).

The concept of governance-related values is less established as a distinct analytical category than fundamental values, although governance-related values themselves, such as equity or sustainability, have been the subject of philosophical and normative debates for centuries (see e.g. Du Pisani 2006; Young 1994). It is based on work of Glenk and Fischer (2010) and normative work on governance in several disciplines, including human geography, political ecology, and policy studies (e.g. Falkenmark & Folke 2002; Ingram 2011; Lockwood et al. 2010; Tortajada 2010). Applied to the field of water governance, studies often evaluate the degree of sustainability (e.g. Iribarnegaray & Seghezzo 2012; Kuzdas et al. 2014), efficiency and effectiveness (e.g. Lieberherr et al. 2012; Wang et al. 2010) or social justice (e.g. Lukasiewicz et al. 2013; Wutich et al. 2013) associated with different governance options. In the value landscapes approach, governance-related values are defined as idealised characteristics or properties of water governance that are expressed as desirable by individuals and groups, thus encompassing the values cited above. They may thus serve as abstract guiding principles in decision-making in water governance, or represent properties of water governance that may or may not yet have been realised. Holders of governance-related values are not only actors and stakeholders within water governance, but also members of the general public (Glenk & Fischer 2010).

The concept of assigned values refers to the concrete values that people attach to the environment, environmental resources, landscapes and places, thus incorporating the perspective of environmental and ecological economics, environmental philosophy, as well as human geography (Brown 1984; Jones, Shaw, et al. 2016; Lockwood 1999; Seymour et al. 2010). Water values

specifically are values assigned to water resources (Bark et al. 2011; Croitoru et al. 2016; Euzen & Morehouse 2011; Gibbs 2010; Hanemann 2006; Ioris 2012a). As such, this category of values is the most prevalent type in the environmental valuation literature, although terminologies may vary widely, with the most common conceptualization framework currently used being the ecosystem services framework (Gómez-Baggethun et al. 2010; Grizzetti, Lanzanova, et al. 2016; Martin-Ortega, Ferrier, & Gordon 2015). Assigned values of water resources may refer to their value for irrigation, human consumption, bathing, navigation, or their role in sustaining ecosystems, as well as more intangible values such as cultural, aesthetic and spiritual values. Assigned values have been measured using a wide range of methods from focus group research to survey approaches, but due to their variability and context-specific nature, their classification and measurement is usually customised to fit the specific research context at hand (Seymour et al. 2010).

There are commonalities but also important differences between all three categories of values. Most importantly, they differ in the locus of values, i.e. where the valuing person locates the values in question. Assigned values are located in an external object, which for the purpose of this PhD thesis are water resources of any kind. Values reside in a river, for example, because it is used for navigation, because it can be used for irrigation and domestic use, or for recreational activity. The river can also be the locus of aesthetic values that only exist as long as the river exists. Assigned values are therefore often context-dependent, and the context may include physical features of the local geography.

Fundamental values are located inside people, either individuals or groups. People are looking to realise them in different situations and they can therefore guide their behaviour. Because of their abstract and universal nature, they are activated in many decision-making contexts, not only in relation to water governance. Crucially, they exist even if a person or group is unable to realise

them in a concrete action. In a theoretical example, a powerful politician may decide to build a dam, even if a few villages will be flooded, if power and achievement rank higher in his personal set of values than universalism and benevolence.[9] The villagers, in turn, may prioritise the values of tradition, security and benevolence, and would thus oppose the building of a dam. The external factor of a power imbalance between the politician and the villagers would, however, prevent the villagers from realising their held fundamental values.

The primary locus of governance-related values is, as the name indicates, in the elements of water governance, which can be processes, institutions, and interpersonal or intrasocietal relations. A river basin committee is a good example of a manifestation of values, i.e. it could be the result of people's desire to achieve participation and democratic legitimacy in water governance. Power relations and interactions between different stakeholders may be seen as the result of certain values as well, for example of solidarity or equity, in a situation where relations are characterised by a desire among all stakeholders to achieve water governance outcomes that benefit everyone. Certain policy instruments, such as water charges, could be interpreted as the result of the governance-related value of efficiency. Therefore, like assigned values, governance-related values are located externally in objects and processes. Similarly to fundamental values, they can at the same time be located in people, for example if a group of people has a strong desire for social justice, even if they cannot act upon it. This is why governance-related values occupy a middle position between fundamental values and assigned values (Figure 2.1). They are not as universal as fundamental values – one may value transparency and participation in governance, but not necessarily in all

[9] Universalism is defined by the goals of: "understanding, appreciation, tolerance, and protection for the welfare of *all* people and for nature" (Schwartz 1996: 3). Benevolence is defined by the goals of: "preserving and enhancing the welfare of those with whom one is in frequent personal contact (the 'in-group')" (ibid.).

arenas of life – but neither are they as concrete and easily located in an external object (i.e. water resources) as are assigned values.

The arrows in the figure represent influence on another component or a theoretical relationship between components. Fundamental values of a person or a group influence their decisions within governance, thus possibly affecting politics, policy and polity of water governance as a whole. A person or society that values power and achievement very highly may strive to optimise the efficiency of water governance serving the elites, above all, and may have less consideration for distributional or negative environmental impacts. This example also shows that a causal pathway from fundamental values to water governance may be via governance-related values, which might be united in a common value landscape.

Water governance can also influence people's values, for example considering the negative impact of participating in market transactions on people's moral values (Falk & Szech 2013). In a context of water politics that is dominated by few powerful players, for example, many people may have a desire for more public participation and democratic legitimacy (as examples of governance-related values). While water governance cannot eliminate people's fundamental values, it can have an impact on the prioritisation amongst fundamental values. Fundamental values are rather universal, making them relevant for both the formulation of governance-related values and assigned values. Additionally, they influence concrete decision-making in water governance.

To illustrate how the theoretical remarks made in the previous paragraphs could apply in reality, the general value and governance categories with their concrete counterparts have been replaced in Figures 2.2 and 2.3 (see below). These are of course highly simplified and stereotypical examples, but nevertheless serve the purpose of demonstrating what may be the value base in a concrete water

governance context and how value landscapes and water governance elements interact.

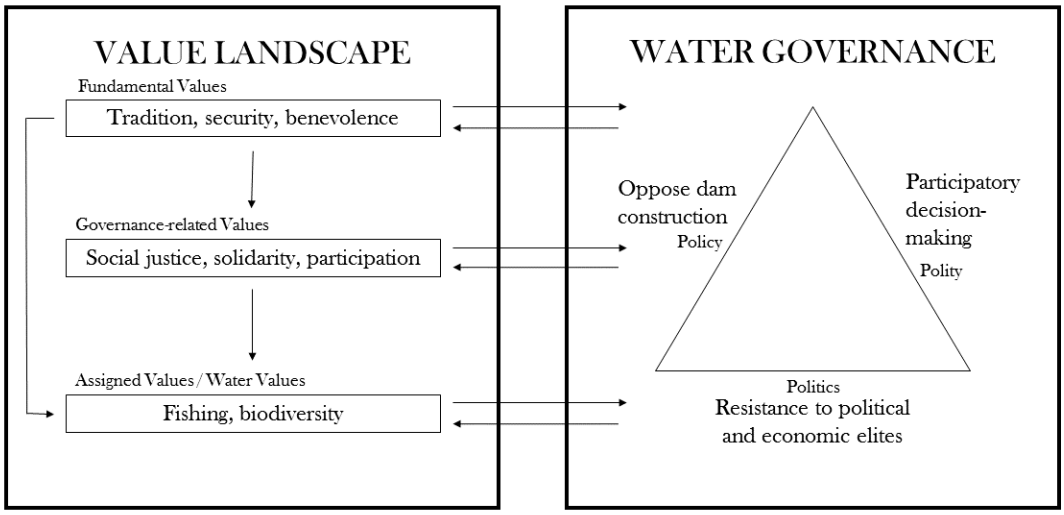

Figure 2.2: Hypothetical example of the value landscape of a villager fighting a dam construction

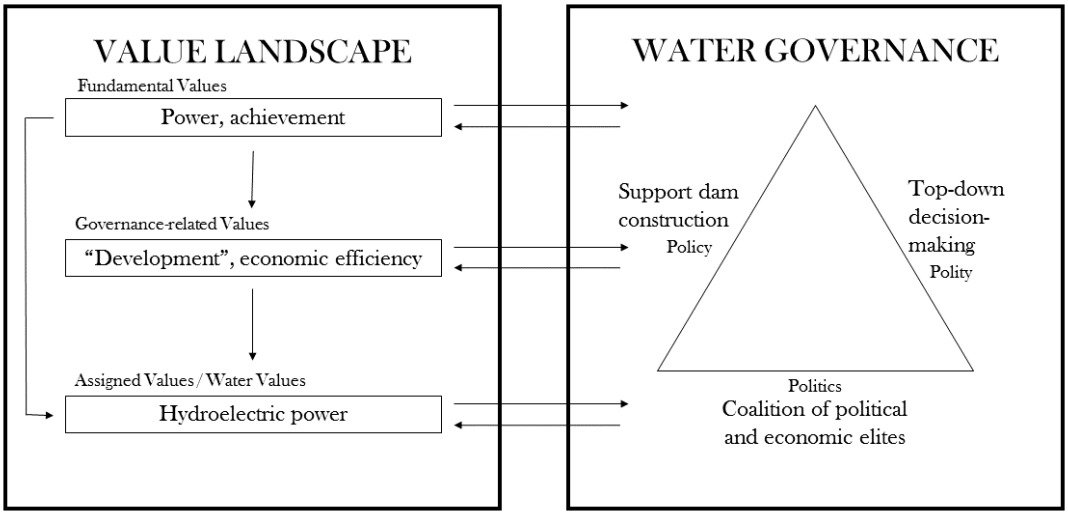

Figure 2.3: Hypothetical example of the value landscape of a powerful politician wanting to build a dam

All value categories can be related to the three governance dimensions of polity, politics and policy in similar ways. A fishing council (as an example of polity) may

be the result of the presence of fishing as an assigned value in a particular area. This assigned value may be connected to politics in the sense that those valuing water for fishing are less powerful than those valuing water for irrigation and agriculture, therefore shaping power relations between different stakeholders. Fishing as an assigned value would likely result in the creation of fishing policies, for example seasonal fishing restrictions. It is straightforward to develop similar examples for relationships between governance-related and fundamental values with polity, politics and policy.

The conceptual framework is characterised by three main features: First, it assumes a strong interconnectedness between water governance and values, which influence each other in both directions. Second, it rests on the idea that there is a hierarchy of different value categories. Fundamental values may influence governance-related values and assigned values, but not vice versa. It is conceivable that over time assigned values of the water environment may impact on governance-related values and fundamental values, irrespective of water governance, but conditions for such long-term change to occur would need to be understood better and would only apply under very limited specific circumstances. Third, the conceptual framework is based on the idea of value pluralism (see previous discussion within environmental philosophy and ecological economics), although from an analytical, rather than normative perspective. Value pluralism is seen as an empirical reality that can be studied, similar to the way in which psychologists study multiple fundamental values. In practice, this means that no attempt is made to 'translate' values into one single category or measurement unit, as is being done for example in studies that apply monetary valuation methods.

The hierarchical organisation of value categories relates to discussions about intrinsic and instrumental values in philosophy. If instrumental values always

need to be related to an underlying intrinsic value,[10] then this creates a hierarchy of different value categories from instrumental values that are often more concrete to the more abstract intrinsic value. For example, if someone ascribes aesthetic value to a waterfall, this assigned value may be seen as an instrumental value that has its origin in the more abstract intrinsic value of pleasure (which one may also call hedonism as in Schwartz' theory of universal value systems). Some people may disagree and claim that the aesthetic value of a waterfall is an intrinsic value that exists regardless of whether it brings pleasure to people (see e.g. Haghe 2011).

However, for the purposes of the present conceptual framework, it does not matter whether one considers certain values to be intrinsic or instrumental, and the question whether the environment has an intrinsic value or not is irrelevant, because it concerns questions in moral and environmental philosophy that can never have a definite answer. The framework is instead to be seen as an analytical tool that helps to understand water governance, and searching for hierarchical relations between values can be useful in this context.

Due to its interdisciplinary perspective, the conceptual framework connects especially well to ecological economics, which is by definition an 'interdisciplinary discipline', with origins in fields as diverse as economics, ecology, environmental ethics, political theory and social psychology (Spash 1999). Furthermore, ecological economics was first established as an alternative to mainstream environmental economics due to its emphasis on the incommensurability of values and value pluralism (Martinez-Alier et al. 1998), one of the defining features of the conceptual framework. The study of values has always been at the centre of ecological economics. A value landscapes approach could be helpful to enhance studies of ecosystem services to understand not just what aspects of water

[10] This follows one particular interpretation of 'intrinsic value', see the previous section on values in philosophy (2.3.2).

resources people value, but also why they value them, given that the way people assign values to water and how they evaluate water governance in their area may be influenced by their fundamental and governance-related values.

2.6 Conclusion

This chapter outlined the complex relationships between values and water governance, and proposed a novel conceptual framework ('value landscapes approach') that integrates insights from various disciplines, including psychology, economics, philosophy, and geography. The conceptual framework considers different value categories in a possible hierarchical relationship. Fundamental values represent abstract goals that people wish to realise across different situations, such as hedonism or security. Governance-related values describe perceived ideal characteristics of water governance, such as transparency, participation or sustainability. These values are taken from normative work on water governance. Assigned values, or water values (with regard to water governance), are located in water resources. Assigned values are often categorised in ecosystem services-based frameworks and as such could serve as an entry point that connects research e.g. in ecological economics with further value dimensions as outlined in the conceptual framework. All three value categories influence water governance in one way or another, and abstract and universal fundamental values may influence the formation of governance-related and assigned values. Equally, concrete water governance situations may also affect people's values, for example where a recent flooding incident activates people's desire for security. Water governance is understood to comprise the entirety of water policy, politics, and polity.

Knowledge of the interrelationships between values and water governance can be used to facilitate the resolution of water governance issues. It can contribute to understanding and possibly mitigating any conflicts that may arise between water

governance actors. Thinking about the values involved can help to identify what matters most for conflicting parties and solutions could be tailored that consider their relevant values. If there are strong differences at the level of fundamental values or governance-related values, conflicts should be expected to be more difficult to resolve as disagreements may arise over a number of concrete decisions. Moreover, governments should strive to address as many values as possible, if they desire to have democratic legitimacy (which is itself a normative governance-related value).

Knowing the local value landscapes can reveal much about political power distribution and democratic legitimacy of water governance. Water governance as a normative concept is based on the idea that all relevant stakeholders should be able to participate in water management processes. If the values present among stakeholders are identified and compared with the values that are addressed by actual water governance, a decision can be made on whether water governance is biased towards the interests of influential stakeholders or whether it truly reflects people's values and desires.

Chapter 3:

Applying a 'Value Landscapes Approach' to Conflicts in Water Governance: The Case of the Paraguay-Paraná Waterway

3.1 Introduction

As outlined in the previous chapter, values are one key element in understanding conflicts (and cooperation) within water governance (Groenfeldt 2013; Hermans, Kadigi, et al. 2006; Ioris 2011). This includes both values that serve as transsituational goals or guiding principles for human behaviour (Glenk & Fischer 2010; Schwartz 1996; Steg et al. 2014) and values of the environment, i.e. how we value for example water resources (Gibbs 2010; Groenfeldt & Schmidt 2013; Ioris 2011; Jackson & Barber 2013; Young & Loomis 2014). In this context, identifying value landscapes of stakeholders in water governance may help to provide a deeper understanding of processes and conflicts in water governance, and they may also serve to evaluate the political legitimacy of water governance projects. Value landscapes take into account stakeholders' positions and preferences within water governance in relation to their values, ranging from more abstract guiding principles to the values that they assign to water resources.

This chapter applies the value landscapes approach to a concrete water governance context, using a qualitative, exploratory research strategy. In particular, the chapter seeks to investigate value landscapes of the main stakeholder groups affected by the plans to construct the Paraguay-Paraná Waterway across the Pantanal of Mato Grosso. The construction and extension of the Paraguay-Paraná Waterway has long been very contentious, as it would potentially affect hydrology, ecology and biodiversity of the Pantanal wetland, the largest continental freshwater wetland in the world and recognised by UNESCO as a biosphere reserve (Calheiros et al. 2012; Gottgens et al. 2001; Hamilton

1999, 2002; Huszar et al. 1999; Wantzen et al. 2008). This in turn may have repercussions for the livelihoods of communities of subsistence fishermen in the Pantanal (see also Neuburger & da Silva 2011). The waterway had first been proposed over 100 years ago and received renewed interest in the 1980s and 1990s (Gioia 1987; Gottgens et al. 2001). The current state government (under the administration of Governor Pedro Taques, elected in 2014) aims at reviving this idea (Arévalo 2015), as the waterway would facilitate the export of agricultural products to world markets, especially soybean, one of the principal products of the state of Mato Grosso (ANTAQ 2013; Peine 2013; Richards et al. 2015). Since the end of the 1990s, Mato Grosso is the main soybean producer in the country and one of the global centres of production (Ioris 2015, 2017).

Given its importance to the agribusiness sector and the regional economy on the one hand, and its impacts on hydrology, biodiversity and local communities in the Pantanal on the other hand, the potential construction of the Paraguay-Paraná Waterway interrelates many aspects relevant to water governance and state politics more generally. Thus it can serve as a worthwhile case study to apply the conceptual framework proposed in the preceding chapter. The present study is also among the first that adopts an interdisciplinary social science perspective on this infrastructure project as existing academic literature is mostly published by concerned ecologists and biologists (e.g. Gottgens et al. 2001; Hamilton 1999) or enthusiastic engineers (e.g. Pires & da Silva 2009; Pompermayer et al. 2014), although Leão et al. (2013) and Pains da Silva et al. (2004) previously summarised local stakeholder opinions in the Pantanal town of Cáceres.

3.2 Political legitimacy and the value landscapes approach

Several authors have suggested that water governance should reflect stakeholders' values to gain political legitimacy and to help with the implementation of water policies (Edelenbos et al. 2011; Groenfeldt 2013; Hermans, van Halsema, &

Mahoo 2006; Hill et al. 2008), often in the context of discussing participatory governance. However, the authors' understanding of the term 'value' often remains vague and it is unclear, what kind of values exactly should be addressed. Nevertheless, if we accept the premise that water governance outcomes should reflect stakeholders' values, a comparison between different stakeholder groups' desired values and the values expressed in actual water governance translates into an evaluation of political legitimacy of water governance. Such a comparison also points to power relations between stakeholders, e.g. where there is a mismatch between desired values and actual values in water governance, while distinguishing between the different types of values that have been described theoretically should offer additional insights beyond unspecific calls to address different values.

Broadly summarising debates on values and water governance, the conceptual framework introduced earlier suggests two main hypotheses: 1) if we know stakeholders' or people's value landscapes (i.e. groups of values that are interrelated) in a given time and location, this can help us understand their preferences and behaviour in water governance and 2) if we compare the values that are expressed by stakeholders with the values expressed by actual water governance (i.e. the ways in which water governance actually takes place 'in reality'), we can make statements about the distribution of political power, as well as the legitimacy of actual water governance in this particular time and location (a perspective which connects well to political ecology).

Furthermore, it should be clarified that the value landscapes approach is a *relational* approach, i.e. values are not studied in isolation, but are seen as interrelated among each other, as well as related to preferences, decisions and actions in water governance. Also, values are *dynamic*, i.e. they may change over time, depending on the social context of a person for example. However, they are considered to be the most stable theoretical construct e.g. in environmental psychology research, if we compare them to attitudes or beliefs for example (Dietz

et al. 2005; Ives & Kendal 2014). Changes in values are thus expected to occur over longer time periods.

Value landscapes, while examples of mental spaces, are interconnected to actual landscapes, or physical spaces. The value landscape of a municipal government, for example, may determine the shape and composition of landscapes within this municipality. Borrowing from Lefebvre's theory on the 'production of space' (1991), one could expect that values expressed in 'representations of space' (how space is *conceived* of by planners, professionals and authorities, as expressed in maps or architecture, for example) would differ from values expressed in 'representational spaces' (how space is *lived* and filled with symbolism and emotions in everyday life by normal people) and 'spatial practices' (the interconnections between representations of space and representational spaces, also known as *perceived* space).

Applying a value landscapes approach should help to clarify our understanding of conflicts in water governance, as one avoids remaining at the concrete level of favouring or opposing a certain policy, for example privatisation of urban water supply. A study of stakeholders' values, for example, can inform us about the actual locus or nature of a conflict; i.e. whether it concerns assigned values, governance-related values and/or fundamental values. In this sense it can serve as a diagnostic tool to identify sources of conflict and their severity. Thus, the conceptual framework and its application as in the present study can have relevance for policy-makers, which may be forced to question whether policies sufficiently address values at different levels.

3.3 The Paraguay-Paraná Waterway

The Paraguay-Paraná Waterway stretches 3442 km from Cáceres in Mato Grosso, Brazil, to the port of Nueva Palmira in Uruguay, connecting the Paraguay and Paraná River Basins, which are part of the greater La Plata basin and partly

within the countries of Paraguay and Argentina (ANTAQ 2013: 3; see Figure 3.1). Sometimes a stretch of the Cuiabá River, an important tributary of the Paraguay River, is included, which would see navigation passing through the capital of Mato Grosso, Cuiabá, up until Rosário Oeste to the north (ANTAQ 2013). Historically, the Paraguay and Paraná rivers had been used for navigation by local indigenous people and early colonisers, leading to the foundation of several towns and cities along these rivers (Calheiros et al. 2012; Siqueira 2002). During most of the 19th century, navigation along the Paraguay and Cuiabá rivers was the main means of transportation to Mato Grosso and its main cities (Corumbá and Cuiabá) and disputes for the control of the waterway triggered the largest conflict ever fought in South America: the so-called Paraguayan War (1864-1870) (Bethell 1996). Currently, traffic concentrates on the segments from the Brazilian town of Corumbá, in the state of Mato Grosso do Sul, downstream, with more than 98% of the load being iron ore produced in mines in said municipality which is then exported mostly to Argentina (ANTAQ 2013: 12).

The modern waterway was conceived of as a motor for economic integration of the La Plata Basin countries of Argentina, Bolivia, Brazil, Paraguay and Uruguay through improved trade and navigation, an idea that has existed well over a hundred years (Gottgens et al. 2001). At some point, the Paraguay-Paraná Waterway was even part of a gigantic plan to connect all major South American river basins through waterways, the 'Great Waterway Scheme', transforming isolated and remote areas of the Plata, Amazon and Orinoco river basins into motors for social integration and economic development across South America through trade (Gioia 1987).

The controversy around the Paraguay-Paraná Waterway concerns the segment between the towns of Cáceres and Corumbá, a large part of which is located in the state of Mato Grosso and is currently usable only by relatively smaller groups of barges carrying up to 8,000 tons (ANTAQ 2013: 29). During about four

Figure 3.1: The Paraguay-Paraná Waterway in South America

months of the year, during the dry season, water levels drop significantly and prevent most commercial navigation (Calheiros et al. 2012). To allow year-round navigation with large barges would require several major engineering works, including dredging of shallow sections, straightening some curves, and removal of rocks (Hamilton 1999). This would impact the hydrology of the Paraguay River and affect the flood pulse of the Pantanal wetland, which in turn is strongly linked to the sustainability of its biodiversity and seems to be vulnerable to even minor changes (Junk et al. 2006). Some of the likely negative impacts would be a significant reduction in floodplain area at low water, thus reducing refuges for aquatic fauna; increased water velocity and reduced water storage in the floodplain, which would potentially lead to flooding downstream; as well as water quality reductions, which may be exacerbated through pollution with fuel and mining products (Gottgens et al. 2001; Hamilton 2002). This could also impact riparian communities in the Pantanal, whose culture and social structure are closely related to subsistence fishing, one of their main sources of livelihood (Wantzen et al. 2008).

While previous attempts to extend the waterway were framed as means to improve regional integration between Mercosur countries (the commercial and administrative integration between five South American countries established in 1991), as described by Gottgens et al. (2001), the current revival of interest in the Paraguay-Paraná Waterway is clearly driven by the agribusiness sector (Arévalo 2015), given its interest in lowering the cost of soybean exports to the world market, especially China (ANTAQ 2013), and expected reductions in freight cost by 30% (Arévalo 2015). In Mato Grosso alone, the market value of the soybean harvest was US$ 7 billion in 2008 (Richards et al. 2015: 4) and Mato Grosso harvested 27.8 % of Brazil's national production of 74,815,447 tons in 2011 (IBGE, cited in Rausch 2014: 280). In some ways, the fate of the waterway may thus be tied to economic development in China, given not only the importance of its demand on soybean production and Mato Grosso's position in this market,

but the state's economy more generally (Ioris 2015; Peine 2013; Richards et al. 2015).

As of 2016, the waterway has passed a technical, economic, and environmental impact assessment (EVTEA, in Portuguese) carried out by a respected national university (UFPR/ITTI 2016), and an eventual implementation seems plausible (although the project would certainly be impacted by the serious national economic crisis and dwindling public funds since 2015, which may prompt novel forms of public-private association, still to be discussed). The actual go-ahead is still uncertain, as both supporters and opponents revive old arguments on the benefits and negative impacts of the waterway (see e.g. Portos S.A. 2016; Schlesinger 2014), citing the likely associated expansion of soybean plantations as a positive or negative development. Building the waterway would also involve the construction of a new port in Morrinhos, Cáceres (de Paula Silva 2015), about 70 km from the town centre of Cáceres (Jornal Oeste 2014), possibly in conjunction with a special economic zone for processing and export (ZPE) which would give tax and tariff exemptions for industrial production and import of raw material. The ZPE has been approved already in 1990, but not implemented due to its controversial impacts and lack of political appetite (da Mota Menezes 2014).

3.4 Methodology

The research presented in this chapter of the PhD thesis followed a qualitative, exploratory and 'bottom-up' methodological approach. 24 semi-structured interviews were conducted between October and December 2014 in the Upper Paraguay River Basin with representatives from different stakeholder groups within the broader water sector, including academics, members of the state government and staff of government agencies, as well as representatives of NGOs, the agribusiness, fishing, navigation and logistics, water supply, consumer

protection[11], and tourism sectors. Some of the interviewees represented more than one sector, e.g. those who had switched careers or who worked in multiple sectors simultaneously. The majority of interviews was carried out in Cuiabá (18) since most major stakeholder associations have their headquarters located there. These were complemented with a number of interviews in rural areas in and around Cáceres in the Pantanal.

Some interviewees were identified via personal contacts and subsequent snowball sampling, whereas others were approached without any prior contact. Some interviewees were members of river basin committees, however, this was not a selection criterion, especially considering the fact that these institutions have been set up in the state only very recently and have had a limited impact so far (Empinotti 2016). Rather, the objective was to interview representatives from as many water-related sectors as possible, while at the same time being fully aware that 'representativeness' here is not to be understood in the statistical sense of the term. The only major omission among water-related sectors covered in this study is the hydroelectric power sector, a representative of which cancelled an interview on short notice citing legal concerns. To protect the anonymity of interviewees, names of their organisations are not listed here, except where it is unavoidable to ascertain that no (potentially negative) repercussions might be caused to interviewees whose statements might not necessarily reflect official communication guidelines of their organisation.

The interviews touched upon more general issues around water governance in Mato Grosso, visions for the future and development of the region, which would help to get an understanding of people's values, as well as more specific questions, including, but not limited to the construction of the waterway and its implications. Further topics discussed beyond the waterway were pollution, sedimentation and

[11] In Mato Grosso and Brazil, there are public consumer protection agencies that deal, among other issues, with complaints about water supply and sanitation.

water quality of rivers, urban water supply and sanitation, water charges, river basin committees and the institutional framework of water governance, changes in the flow regime and ecosystem associated with the construction of hydroelectric power stations (and of course the waterway), as well as fishing and tourism. These topics had been identified beforehand as relevant to the local water management context based on available literature (e.g. Alho & Sabino 2011; Calheiros et al. 2012; Figueiredo et al. 2012; Zeilhofer et al. 2010). However, given the nature of semi-structured interviews, these may have included discussions of additional topics, if deemed relevant during the conversation. Interview transcripts were examined with a content analysis software, the Discourse Network Analyzer or DNA (see Leifeld 2011 for an overview) to identify argumentative categories used by interviewees, including different types of values, as well as statements made on different water governance issues, including the Paraguay-Paraná Waterway.

Following the conceptual framework outlined previously, interview transcripts were specifically screened with the DNA software for statements on 1) fundamental values; 2) governance-related values; 3) assigned values or water values; as well as preferences or positions regarding water governance issues, covering 4) water policy, i.e. instruments and the material dimension of water governance 5) water politics, i.e. the power relations between different actors within water governance, and 6) water polity, i.e. the institutional setting in which water governance takes place.[12] Using these six primary coding categories, it could be identified which stakeholder group expressed which values and how they evaluated different water governance issues, such as the Paraguay-Paraná Waterway. For example, all statements on the Paraguay-Paraná Waterway, or on sustainability were highlighted and extracted into one list, with additional information on the interviewee profile, such as name and organisation, which

[12] This in fact represents a very limited use of the DNA software, which was originally developed for the quantitative analysis of so-called 'discourse networks' (Leifeld 2011), while it was employed here instead because of its ease of use, free access, and good functionality for the content analysis of texts.

facilitate the selection of representative or noteworthy quotes for the analysis in the following sections. Very few interviewees made statements in relation to fundamental values, probably due to the fact that fundamental values are located at a deeper level and people generally would not typically reflect on them in conversation, a problem reported also by Seymour et al. (2010). Thus there was insufficient data to deepen their analysis. Therefore, this chapter focusses on governance-related values and assigned values, this representing one of the limitations of the exploratory stage of the PhD fieldwork.

3.5 Results and discussion

For clarity this results and discussion section is divided into a sub-section on policy, polity and politics (i.e. water governance aspects) on the one hand, and a sub-section on the value aspects on the other hand. While interviewees would not usually establish links between their values and their preferences and actions in water governance themselves, different value landscapes may have shaped the conflict between supporters and opponents of the Paraguay-Paraná Waterway as outlined in section 3.5.3, thus linking both sides. Throughout the analysis and discussion, examples of quotes from the interviews are used to illustrate how values and opinions on water governance were expressed by interviewees.

3.5.1 Policy, polity and politics aspects

First of all, the interviews with the agribusiness sector confirmed that this stakeholder group is unambiguously in favour of the waterway under the assumption that it will improve transport logistics, which is the main issue of the public debate about the future of crop production in the state. For example:

> *"About the issue of waterways, today in Mato Grosso, we have the need for this, but nothing is put into practice. For us, here, it would be ideal on the Paraguay River, which has the capacity for this."*
>
> (Representative of an agribusiness association) – quote 1

The agribusiness sector was joined in its support by government representatives as well as members of the navigation and logistics sector, as illustrated by statements such as:

> *"It is the objective of the state government to make* [the waterway] *viable, given the fact that Mato Grosso needs* [...] *to reduce freight costs, because of the distance that we have to the major Brazilian export ports."*
>
> (Senior official in the Secretariat for the Environment, Mato Grosso) – quote 2

> *"The waterway is the most economic and ecological mode of transport that exists, so we have to make use of it"*
>
> (Logistics consultant and lobbyist) – quote 3

With regard to the politics behind the construction of the Paraguay-Paraná Waterway, it could be confirmed through interviews with the agribusiness sector itself that there are strong links between the logistics and agribusiness sectors and the state government, and that the renewed attempts at building the waterway are thus the direct result of lobbying or even capture of the state government by these sectors:

> *"About the government I would say* [...], *who is going to become a secretary of logistics is one of our executive directors* [...] *so I believe that these questions around logistics, with regard to the use of railroads, highways, and waterways* [...], *as a direct consequence, we are going to have positive change."*
>
> (Representative of an agribusiness association) – quote 4

> *"The incoming government is on the side of the agribusiness, so we expect positive change not just with regard to logistics, but also phytosanitary defence* [i.e. regulations about pesticide use] *"*
>
> (Representative of an agribusiness association) – quote 5

> *"So we showed the government the need for the existence of the waterway and that we needed to do this in a planned manner."*
>
> (Logistics consultant and lobbyist) – quote 6

This description of state politics by the agribusiness sector itself is also confirmed by statements made from representatives of different stakeholder groups, e.g. the environmental NGO sector who was highly critical of the political and economic prominence of the agribusiness sector, and who also briefly commented on the institutional (polity) aspects around water governance in Mato Grosso:

> *"Who dominates the state government, the legislative assembly, who dominates the municipal governments are the people from the agribusiness and they channel all the resources into support for the agribusiness."*
>
> (Environmental NGO representative) – quote 7

These findings on the politics behind the construction of the Paraguay-Paraná Waterway and water governance more generally confirm previous research by Safford (2012) who cited that agribusiness organisations view aggressive government lobbying as a legitimate strategy to advance agricultural production in the state. However, since he conducted his research (between 1998 and 2002), this has been taken to a level in which the state government itself is partly composed of members of the agribusiness sector, thus speaking of 'lobbying' may be an understatement. Similar developments could be observed more recently at the level of the federal government, too, with the appointment of senator Blairo Maggi, Mato Grosso's so-called "soybean king" and former governor as the Minister for Agriculture in 2016 (HuffPost Brasil 2016). Mato Grosso's agribusiness sector thus has exerted great influence on the federal government, which is strategic as national agencies will be in charge of implementing the modern waterway (this is a constitutional requirement, given that it would involve national rivers and the work will stretch through more than one state).

The main opponents of completing the Paraguay-Paraná Waterway in Mato Grosso (which pertains to the policy dimension of water governance) were representatives of environmental NGOs, the fishing sector, some academics and local communities in the Pantanal. They expressed their concerns about potential impacts, and disapproval in statements such as the following:

> *"The waterway will deepen the riverbed. Deepening the riverbed, the bays are gone. So the Pantanal will be gone."*
>
> (Local fisherman in the Pantanal) – quote 8

> *"I think that what I should comment is that the authorities should come here and see this here. The authorities only know how to do things on paper, they don't see our reality. Our governor has never gotten to know the Pantanal and then approves a law to establish a waterway* [...] *I would like that the governor came here to see..."*
>
> (Member of a local community in the Pantanal) – quote 9

> *"It would be devastating if they did* [build the waterway]*."*
>
> (Environmental NGO representative) – quote 10

> *"There was a big global movement against the Paraguay-Paraná Waterway, in the times of Fernando Henrique* [Cardoso, former Brazilian president in the 1990s]*, there were more than 300 NGOs called the 'Living Rivers Coalition'.* [...] *There were Brazilian NGOs, of the entire river basin, NGOs from Argentina, Uruguay, the US, Europe, the Netherlands,* [...] *the big NGOs, International Rivers Network, Wetlands International, and I think WWF as well."*
>
> (Researcher and activist) – quote 11

Thus the opposition to the waterway in the 1990s was mainly successful due to the broad cooperation among NGOs and international support of the protests, and there are some similar developments today, with international NGOs cooperating with local NGOs to protest against the waterway (see e.g. Schlesinger 2014). Finally, some interviewees, for example from the tourism sector, were more differentiated in their response to the waterway, supporting it, but specifying

conditions such as that ecological impacts should be minimised, or that jobs for local people should be created, e.g.:

> *"It is a necessary evil. But I think there should be a plan* [...] *which would minimise the impact, there should be studies regarding the capacity of the barges. It is a necessary evil, for the transport of these products.* [...] *The state needs it, as long as it is done, with critical assessment, with planning, which will avoid big impacts. That could work."*
>
> (Representative of a tourism association) – quote 12

Figure 3.2 summarises the stylised politics behind the Paraguay-Paraná Waterway:

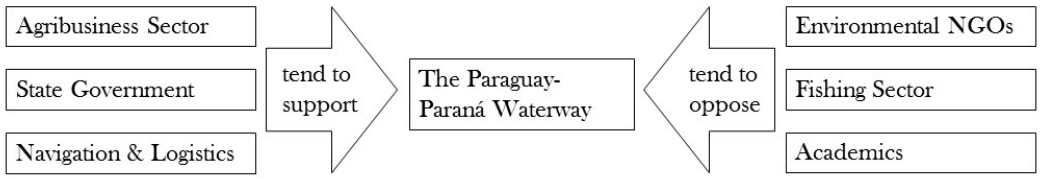

Figure 3.2: Stylised politics behind the Paraguay-Paraná Waterway

With regard to institutional or polity aspects, several interviewees discussed their engagement with official forums, especially river basin committees, which are supposed to deal with all water governance issues around rivers in Brazil that affect multiple stakeholders (Magrini & dos Santos 2001; Veiga & Magrini 2013). However, while these so-called 'water parliaments' were mostly described as the correct way forward on paper, in practice, they have not had much impact in most river basins in Mato Grosso. This is mostly because they have been set up only very recently or not yet at all and suffer from a lack of funding:

> "[Funding comes from] *contributions of the water users* [...], *sometimes a project from ANA* [the national water agency] *finances something, so we use these resources to make things happen; partnerships between the municipal government to provide the lorry;*

> *the water user to provide the farm worker to work; the professor..., the NGO guy offers to prepare food to give to the worker to provide the service. It's a really very amateurish thing because of the lack of funding. If you have civil society mobilised through the river basin committee, it has to be really very mobilised, because it won't have financial support for anything."*
>
> (Staff member in the Secretariat for the Environment, Mato Grosso) – quote 13

However, another reason for the lack of impact was that members did not see them as a place where compromises can be reached between different ideological positions (and thus values), as expressed in the following quote by a representative of the agribusiness sector:

> *"I think the river basin committees* [...] *have everything to function and produce wonderful work, if you like. The problem is that there are many people with ideologies who do not really want to protect the environment.* [...] *They have an ideology that is an ideology: 'This cannot happen.' It cannot happen, but then, what is the solution? What are you going to do to help so this won't happen?"*
>
> (Representative of an agribusiness association) – quote 14

3.5.2 Assigned (or water) values and governance-related values

While the previous section served to provide a brief overview of the politics, policy and polity aspects behind the Paraguay-Paraná Waterway, this section discusses the value dimension of the conflict between supporters and opponents, who are not just characterised by different inherent interests in favour or against the waterway, but different value landscapes which shape their preferences and behaviour. In the interviews, stakeholders were asked to reflect on the importance of the local rivers and the Pantanal for the people and the state of Mato Grosso to elicit what assigned values or water values they associate with these. All interviewees cited strong general importance of the rivers and Mato Grosso's water resources, in statements such as the following:

> *"It has extreme importance, it is essential. Today, the Cuiabá River* [a major tributary of the Paraguay River that may eventually become part of the waterway] *is in fact our source of life."*
>
> (Senior official of a state government agency) – quote 15

However, responses differed with regard to further assigned values beyond the obvious importance of water for human survival. Members of the agribusiness sector cited exclusively economic values, such as the importance of water for agricultural production, cattle ranching, fishing, aquaculture, navigation and tourism, which is interesting in the sense that they did not just cite economic values that were of their own concern, such as water use for agricultural production; rather, they did attempt to describe wider water values, such as for tourism, that were not related to their own business, but did not mention the wide-ranging cultural, historical and other non-economic values of water in the river basin. Clearly, thinking in economic terms and viewing water mainly as an economic resource was prevalent among interviewees from this sector (in fact they often preferred the term 'water *resources*' to refer to our interview topic, which captures a distinct worldview linguistically).

Members of the local communities and representatives of the fishing sector, in turn, expressed only non-economic values, with the unsurprising exception of fishing as an assigned value. These non-economic values included aesthetic, cultural and ecological values, expressed in statements such as:

> *"Our culture is the river. Our way of life."*
>
> (Local fisherman in the Pantanal) – quote 16

There was little overlap with the values of the agribusiness sector interviewees as the fishermen did not acknowledge the wide-ranging economic values that water has in the region and instead focused on their own immediate surroundings. Living near and of the water has shaped local culture over the centuries, with subsistence fishing and cultural traditions merging to become one (lifestyle), as expressed in this statement:

> *"Look, the future of fishing here, it is our future, and we live from it directly, right? We live from it directly. If we were to leave our profession, this would be... I mean, we depend on the river..."*
>
> (Local fisherman in the Pantanal) – quote 17

Assigning economic values to water had never been a necessity, given the traditional abundance of fish that would comfortably sustain local communities, although with declining fish numbers and ever-increasing fishing restrictions (Chiaravalloti 2017), circumstances and perceptions are slowly changing. Generally, however, the cultural values of water seem to still dominate local people's perception. The relationship of traditional communities and culture with the river has been well-documented e.g. by Loureiro (2006) who gives an overview of religious festivities that often involve washing the figure of a saint in the river or da Silva Santos (2010) which examines traditional dances, such as the siriri, which make reference to the Paraguay River.

The assigned values of the Pantanal specifically were especially well captured in the following statement by a representative of the tourism sector, which explained the popularity of fishing tourism in the Pantanal:

> *"The first touristic aspect of the Pantanal is landscape appreciation. A guy comes to fish in the Pantanal not just because there is pacu, dourado, tucunaré...* [local fish species]*, but because the visual aspect is magnificent. Because a photo taken in the Pantanal is a different reality. Because you're fishing here and you can encounter an anaconda that is wanting to catch the same fish, the caiman, too."*
>
> (Tourism guide) – quote 18

Besides mentioning the aesthetic, ecological, and economic values of the Pantanal for fishing tourism, the quote also demonstrates the strong interrelatedness of these values, which could all come under threat with the construction of the Paraguay-Paraná Waterway. The Pantanal has long been a popular destination for fishing tourism for wealthy Brazilians who would travel far for an opportunity

to experience it, although nowadays there are many concerns about overfishing and fish decline (Martin-Ortega et al. 2011).

While local people did not highlight ecological values of the Pantanal much, these are inherently connected with the cultural and livelihoods values of subsistence fishing, as a member of an NGO pointed out:

> *"*[The Pantanal is] *home for a multitude of fish that provide much of the food for the other multitude of wildlife that's found in this tropical region. Without the rivers we wouldn't have the wildlife and the rest of the wildlife that we have here, because it's all so interconnected. Certainly the fishing industry provides livelihoods for people professionally and also for subsistence* [...]*"*
>
> (Environmental NGO representative) – quote 19

With regards to governance-related values, the agribusiness and navigation sectors mainly expressed values such as economic efficiency, effectiveness or pragmatism, order (in the sense of legal certainty, security and ability to plan more generally), and sustainability. For example, when asked to reflect on the challenges of the Paraguay-Paraná Waterway, a representative of the navigation and logistics sector was mainly concerned with its economic efficiency:

> *"The biggest challenge of the Paraguay Waterway,* [...]*, it is very long, it will be 3200 km from the point where we want to build it until Nueva Palmira, Rosario, in the south of South America. Given the fact that it is very long, it loses a bit of its competitiveness compared with other modes of transport that cover minor distances."*
>
> (Logistics consultant and lobbyist) – quote 20

This statement shows a remarkable lack of reflection on the ecological impacts of the waterway (there was no comment on these at any point of the interview), and the ensuing impacts on local communities in the Pantanal. The only concern is the economic efficiency of navigation on the Paraguay River, which served as a guiding principle for this sector's spokesman's preferences in water policy and the concrete case of the waterway. Here we also have an example of how

representations of space, following Lefebvre's language (i.e. how space is *conceived of* by planners, professionals and authorities), operate in practice and how one expert's representation of space relates to his value landscape. Clearly, his representation of space is characterised by a value landscape dominated by considerations for efficiency, with concrete repercussions for the actual physical and social space, should his lobbying eventually lead to the construction of the Paraguay-Paraná Waterway.

Closely related to economic efficiency, i.e. thinking about achieving something at minimum cost and generally focusing on costs and benefits as guiding principles, is the governance-related value of effectiveness, i.e. focusing on the outcomes of policies and whether they achieve what they set out to achieve. Effectiveness, in turn, is closely related to pragmatism, i.e. a principal focus on the practical (outcomes of water governance). An example of the agribusiness sector identifying effectiveness and pragmatism as their main guiding principles in water governance is the following quote, which discusses the problems with river basin committees (and thus also serves as an example of clear linkages between stakeholder's values and elements of water governance):

> *"I see that the river basin committees have everything to work well, but as long as they remain on this path of ideology they won't work, I think they need to go much more towards the practical, much more towards the effective.* [...] *to resolve the problem and that it doesn't just stay at the stage of discussion, discussion, discussion, but nothing of effectiveness, which is what I call ideology."*
>
> (Representative of an agribusiness association) – quote 21

The agribusiness sector thus describes itself as the main actor that is concerned about effectiveness, even with regard to environmental protection (see quote 14) due to its commitment to pragmatism, whereas other stakeholders and the government itself are disqualified as non-effective ideological actors (of course, missing the point that a strong focus on efficiency, effectiveness and results-based governance is an ideology, too).

The governance-related value of order was expressed in statements such as the following, which also attribute the responsibility for creating order exclusively to the government:

> *"I think the biggest challenge of the productive sector today is public administration* [...]. *We know that laws exist, and rules to be complied with, many of us try to comply with them, but many do not manage to comply with them, because the government itself does not achieve to implement its own policies."*
>
> (Representative of an agribusiness association) – quote 22

This argument also follows a familiar pattern of attributing responsibility for water governance failures to other actors that are usually only vaguely defined, as described previously by Ioris (2013) in a study on the management of the Pantanal wetland; as well as of the agribusiness sector vaguely blaming the government for any challenges arising to agricultural production regardless of their actual origin (Peine 2010). This lack of order and adherence to rules was a common source of frustration among several interviewees, especially the agribusiness sector, but also researchers and government representatives, as expressed in statements such as the following:

> *"We need to put rules in places, implement rules, and follow rules* [...]. *We need rules in the Pantanal, to have a bright future there."*
>
> (Member of the state government) – quote 23

> "[It would be desirable] *that there was compliance with environmental legislation. In my opinion, the legal situation in Brazil is actually not bad, with regard to issues of environmental politics.*"
>
> (University professor and researcher) – quote 24

This strong desire for rules and enforcement of (environmental) laws stands in contrast to the social phenomenon popularly known as *jeitinho* (i.e. creative strategies to avoid complying with rules and regulations), supposedly an integral part of Brazilian culture (DaMatta 1986; Prestes Motta & Alcadipani 1999). According to anthropologist DaMatta, there is a constant mismatch between the

Brazilian legislation and actual social relations, which is considered to be the normal state of affairs, and which may help informally to get things done. The agribusiness sector's calls for order thus represent a typical, almost reflex-like reaction to the perceived normality of everyday disregard for the law (even though there are plenty of examples that this sector does not always comply with environmental legislation either, which they readily admitted, see quote 22). Calling for order in this way is also a way of establishing perceived superiority of one's own moral standards or behaviour and alludes to the agribusiness sector's position in Mato Grosso's society. To call for order implies some sort of moral and political authority and gives legitimacy to one's own water governance preferences over other stakeholder groups' preferences.

Interviewees connected these governance-related values with a vision for Mato Grosso of conventional economic development that also implies a rejection of traditional lifestyles. One could classify this 'development' as one of the guiding principles that would favour the construction of the Paraguay-Paraná Waterway. It was expressed in statements such as the following:

> *"I think that* [the Cuiabá region] *needs to expand in every sense, today there is a lot of cattle ranching* [...] *we joke about those native people of the 'father to son, son to son type' that never made any change to their habits and properties. There is a big need for growth."*
>
> (Representative of an agribusiness association) – quote 25

Governance-related values of activists, the fishing and NGO sectors were remarkably different. Their statements expressed values such as social justice, equity, and solidarity, also in regard to the Paraguay-Paraná Waterway, for example:

> "*So we are concerned about the social question, the riparian communities and the traditional people,* [...] *who are very dependent on a healthy environment. So* [hydrological changes, such as those caused by the waterway are] *a social problem, too.*"
>
> (Researcher and activist) – quote 26

> "[About the agribusiness sector]*, it is a concentration of the use of natural resources for just a small part of society. So, it is the concentration of wealth, originating in the natural resources that are* [meant to be] *public, for* [just] *one part of society.*"
>
> (Researcher and activist) – quote 27

> *"Today we are left with this dispute of this one against that one* [...] *of the powerful against the powerless."*
>
> (Local fisherman in the Pantanal) – quote 28

Social justice thus concerns issues of distributive justice, typically in a narrative in which small agribusiness elites appropriate Mato Grosso's natural wealth and do not share it with the majority of society.[13] In this context, it should also be noted that exports of primary products, such as soybean, are tax and tariff free since 1996, potentially adding to social and distributive justice concerns (Laval 2015). Social justice also broaches the issue of power imbalances, where said elites grow their wealth at the expense of politically insignificant groups, such as local communities, for example through building the Paraguay-Paraná Waterway.

Solidarity more specifically, in the sense of respecting other stakeholder group's needs and interests, and accepting compromises, was exemplified in statements such as the following, which furthermore also captures a desire for equity:

> *"I am part of the Environmental Council, too,* [...] *we debate this a lot; we need to demonstrate that we are not against tourism, we are not against anyone, but it should be an egalitarian thing."*
>
> (Representative of a fishing association) – quote 29

Solidarity, however, was not extended to the agribusiness sector, but rather local actors within the community, such as tourism operators. This is very likely because equity was an equally important guiding principle, which is violated by the agribusiness sector (following the dominant view as exemplified in quote 27).

[13] It should be noted that contrasting narratives exist: see e.g. Richards et al. (2015) who claim that on the whole, the activities of the agribusiness sector have been beneficial for Mato Grosso economically, even when taking into account the negative impacts of deforestation and related environmental destruction.

The strongest statements about equity were made by NGO representatives, e.g. in the context of land ownership and associated inequalities in agribusiness-related income:

> *"Of those that own more than 2,500 hectares in the state of Mato Grosso, they are* [...] *around 3.7%, if I am not wrong, and these landholders own 63% of agricultural land.* [...] *So this concentration of land is barbarism."*
>
> (Environmental NGO representative) – quote 30

Thus, the absence of the governance-related value of equity was seen as one of the major factors to blame for water governance problems in the state, which could also explain why the Paraguay-Paraná Waterway is still high on the state government's agenda, despite its benefits for a small economic group only. Unsurprisingly, values such as equity and solidarity were not expressed in the same way by the agribusiness sector, since they are the main beneficiaries of the unequitable policies of the state. If 'development' is one of the guiding principles for the agribusiness sector, among the local communities and opponents of the waterway, it could be conservation (of the status quo) or traditions:

> *"The Pantanal's society depends on the most natural functioning possible of the rivers. With hydroelectric power stations, aggradation of rivers, the waterway and all that, you tend to alter the hydrodynamics of the system, and consequentially, the environmental services."*
>
> (Researcher and activist) – quote 31

Valuing conservation above all, and viewing any changes to the Pantanal as negative, is a widespread view among environmentalists and local communities, which is why they frequently experience value clashes with agribusiness representatives and their allies, for whom change and development are the more important values. In informal conversation about environmentalists who oppose any change, they were referred to as *eco-chatos*, i.e. boring or annoying

environmentalists (as opposed to environmentalists who would accept and support moderate change).

Finally, sustainability was brought up quite frequently by members of the agribusiness sector, but also the government, NGOs, researchers, and fishermen, thus spanning stakeholders from the full spectrum of positions regarding the Paraguay-Paraná Waterway:

> *"For a farmer to be sustainable he needs to be economically fine, and he needs guarantees, legal certainty for his rural property, around phytosanitary defence* [...] *around logistics, too, have conditions to ship his products, have the right to come and go, not to die in the middle of the highway either, this is still our reality today. The environmental question, production... so sustainability is really a broad term and we try to broaden it as much as we can."*
>
> (Representative of an agribusiness association) – quote 32

> *"So, to be sustainable,* [...] *if the tourist stops taking* [the fish] *the income level will rise, there will be more fish in the river, the income of the fisherman will rise. So it would be sustainable, because the tourist will create more jobs, he is making use of the natural goods that belong to everybody, and at the same time, he creates a return for these communities, for these fishermen."*
>
> (Representative of a fishing association, here commenting on fishing tourism in the Pantanal) – quote 33

> *"A complete lack of sustainability, this model* [of agribusiness in Mato Grosso] *is not sustainable.* [...]*, because it only tries to extract the wealth for few people."*
>
> (Environmental NGO representative) – quote 34

In most cases, sustainability was seen as a generic form of long-term viability of a process or system. However, the respective process or system may not necessarily be similar, as seen in the quotes, meaning that even though all stakeholders would agree that sustainability is an important, if not the most important governance-related value, they may in fact understand it in contradicting ways. For one, sustainability is synonymous with maintaining and expanding the agribusiness

sector, while for the other, the very existence of an agribusiness sector (as opposed to agro-ecological models) is an indicator of unsustainability. Sustainability as a governance-related value by itself is not sufficient to provide much guidance (although similar things could be said about efficiency or effectiveness or indeed, any value, as O'Neill 1993 points out).

3.5.3 Synthesis and discussion

As an overview of the results, it can be suggested that opposition and approval of the Paraguay-Paraná Waterway can be interpreted as a clash of value landscapes, as seen in Figure 3.3; and that these different mental spaces among different stakeholder groups have concrete consequences for the social production of spaces (Lefebvre 1991). In this case, this concerns not just the question whether there will be a waterway or not, but much wider associated land-use changes that would ensue with its construction. Improved infrastructure has been identified as a major driving force behind land values in the Pantanal and surrounding areas (Lourival et al. 2008) and one could expect an expansion of soybean production as a direct consequence of building the waterway, a radically different land-use than the current cattle ranching and native vegetation.

Different stakeholder groups not only differ in the ways they value water resources, if we compare, for example, the value of water for aquaculture vs. the value of water for subsistence fishing, which occur in a completely different institutional and social context. Stakeholder groups also differ in their underlying governance-related values. While there is some overlap with regard to similar nominal commitments to sustainability, this value seems to be one of the weaker guiding principles, and is mostly used as a fashionable qualifier for any statement on water governance or behaviour whatsoever. This is likely a global phenomenon, given that people often do not clarify their understanding of sustainability and may thus have completely opposing visions what 'sustainable

water governance' may mean in practice and whether it would include the construction of a waterway through the Pantanal or not (both arguments could be readily made citing sustainability of agribusiness on the one hand or environmental sustainability on the other hand).

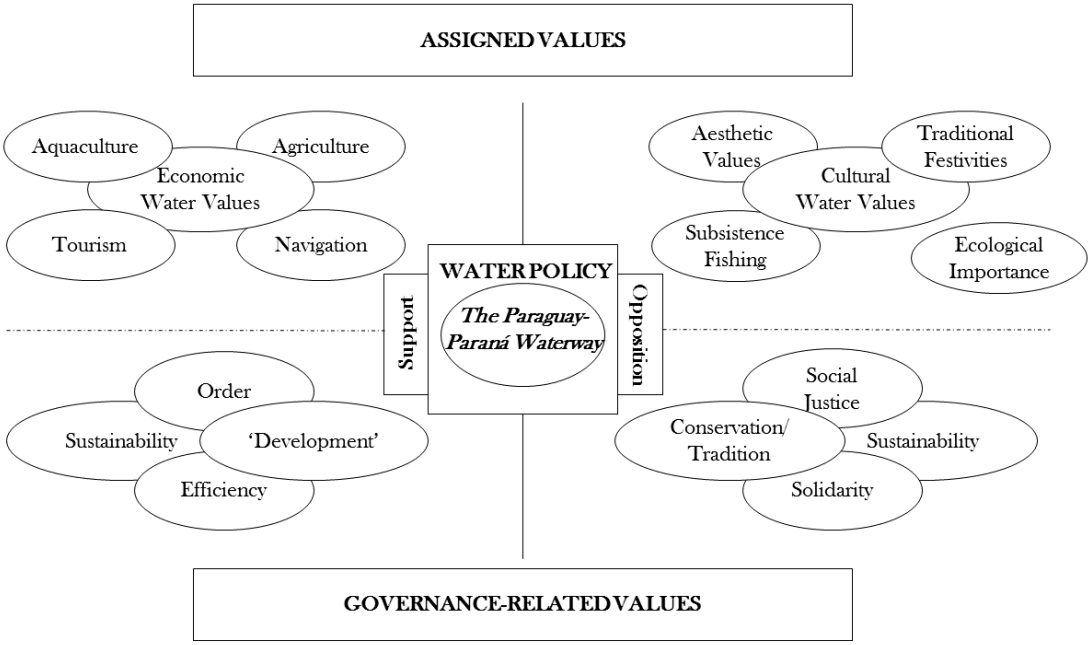

Figure 3.3: Clashing value landscapes around the construction of the Paraguay-Paraná Waterway

The identified value landscapes should not be seen as an absolute statement, in the sense that a member of a fishing community could never think about efficiency or development, whereas a member of the agribusiness sector may not occasionally be concerned about aesthetic values. Rather these value landscapes are meant to represent the dominant values within the respective groups, which eventually shape opinions on the issue of the Paraguay-Paraná Waterway. While the broad fault line lies between fishermen and environmental NGOs and the agribusiness and logistics sector as outlined in section 3.5.1 and visualised in Figure 3.2, individual members seemed to break out of this pattern, with one fisherman advocating the installation of heavy industry in Cáceres and one NGO

member cautiously supporting the waterway and accusing other NGOs of a lack of pragmatism. This shows that values are not completely homogenous within different groups of society and differences may produce alternative opinions that counter the dominant position in these groups.

Different value landscapes might not just be related to each stakeholder group's role in society, but they may also relate to their origins in migration patterns in the state of Mato Grosso, in which traditional communities have persisted over centuries on subsistence fishing and traditional cattle ranching, whereas relatively recent newcomers from the south of Brazil have been the most active in expanding agribusiness in the state (Rausch 2014; Silva & Sato 2010). These groups often live in separate spaces, and some cities and towns in Mato Grosso are known as 'Southerner's towns', which differ considerably from neighbouring traditional towns.

To address conflicting values in the case of the Paraguay-Paraná Waterway seems challenging, given all the differences outlined previously. Firstly, it appears that the conflict is not just located at the concrete level of building the waterway or not, but in fact concerns assigned values, governance-related values and might even concern fundamental values; in this scenario, reaching a compromise is highly unlikely. Clearly, the waterway would have to be implemented in such a way that it allows local communities to maintain their traditional culture and livelihoods, while also channelling some resources gained through the construction from the agribusiness sector to them, for example through taxation and redistribution. This could possibly be seen as an efficient strategy by the agribusiness sector, if international pressure or pressure by their main buyers was strong enough. Alternative solutions to bridge the divide between different value landscapes that have been suggested (D. Groenfeldt, personal communication, Feb. 2, 2017) include a switch by Mato Grosso's agricultural sector to higher value agricultural products, which would reduce the relative significance of transport costs, new

barge designs that would function at very low water flows, as well as the introduction of a sustainability label that gives soybean farmers credit for saving the Pantanal and would fetch higher prices on the market. Nevertheless, given that Mato Grosso's agribusiness sector operates under the principle of profit maximisation, and sustainability labels have failed before in the area (Charnoz 2010), caution remains warranted about such innovations (see also Schulz et al. 2015).

Secondly, it is evident that any major decision in water governance, as part of the politicised organization of water management, is inevitably going to benefit some and disadvantage others. The fact that the current state government is clearly supporting the Paraguay-Paraná Waterway means that they have taken the side of the more powerful stakeholder groups in Mato Grosso. Despite the rhetoric of participation and stakeholder engagement that surrounds water governance in Brazil following the 1997 water law no. 9,433 (Magrini & dos Santos 2001; Rodrigues et al. 2015), economic and political influence of small elites still dominates and persists, and conventional and structural solutions such as the Paraguay-Paraná Waterway are still favoured by the political system. The waterway could hardly be considered to be an innovative approach, given the long time it has been under discussion; but equally it can be said that water reform in Brazil perpetuates existing power imbalances, given, for example, that river basin committees can hardly step in to make water governance more balanced without independent funding. The identification of value landscapes has, however, made some aspects of the political conflict more transparent, and could serve as an input or starting point e.g. for process-based strategies involving participatory workshops and facilitation between stakeholders to eventually identify a compromise between stakeholders.

3.6 Conclusion

As the research presented in this chapter should have shown, a value landscapes approach can help to provide a more in-depth understanding of conflicts in water governance. Studying the value base of water governance involves identifying different types of values, such as assigned (or water) values, governance-related values, fundamental values, and the different elements of water governance, i.e. policy, polity, and politics. Value landscapes are examples of mental spaces with direct implications for the social production of spaces (Lefebvre 1991).

In the present case, it could be shown that disagreements on the construction of the Paraguay-Paraná Waterway in the Brazilian Pantanal are not merely defined by a simple approval/opposition dichotomy. Rather, different stakeholder groups also expressed different values. In the case of governance-related values, social justice, solidarity, equity and conservation/tradition were expressed by opponents (mostly fishermen, environmental NGO representatives, and some academics), and economic efficiency, effectiveness and pragmatism, order and 'development' were expressed by supporters (mostly representatives from the agribusiness, navigation and logistics sectors, as well as the state government). On the level of assigned or water values, the difference concerned the contrast between economic values on the one hand, and cultural/ecological values on the other hand.

Thus, the conflict around the waterway is very deeply rooted, since it concerns several levels of values; it seems unlikely that a compromise could be found which would satisfy the opposing stakeholder groups. It can be argued that the conflict is not limited to this concrete project, but rather, we are witnessing a deep clash of different value landscapes. This may be one of the reasons why this conflict has persisted for so long, over several decades and is periodically revived without any solutions or compromise.

From a political ecology perspective, it appears that powerful political and economic elites dominate water governance, in a coalition between the

agribusiness and logistics sectors and the state government. These stakeholder groups' values are overrepresented in Mato Grosso's water governance and the values expressed through the construction of Paraguay-Paraná Waterway are clearly more representative of the elite's values, as opposed to the values of the less powerful opponents. Or, borrowing Lefebvre's language (1991), representations of space conceived by the state government and agribusiness sector and shaped by their value landscapes are in conflict with representational spaces (i.e. how space is *lived* and filled with symbolism and emotions in everyday life by normal people) of local communities in the Pantanal wetland and their value landscapes. Linking value landscapes to a discussion of political power in a given historical and geographical context thus adds important insights.

Concrete policy implications of the study could be that participatory institutions need to be improved to address some of the power imbalances and strengthen the inclusion of value landscapes of less powerful stakeholder groups, if we consider political legitimacy a worthwhile objective of water governance. A river basin for the Upper Paraguay River Basin is just being set up and it remains to be seen whether it can contribute to the debate about the waterway, which also depends on the federal government. Furthermore, strategies need to be identified that can help to overcome the gridlock between supporters and opponents and their respective values by either reducing the need for a waterway altogether or reducing its potential impact, this way addressing both value landscapes as well as possible. Finally, the present study demonstrates that a value landscapes approach can serve as an entry point to broader debates around political power, and the relationship between mental, social, and physical spaces, and that the hypotheses suggested here would be a worthwhile subject of further quantitative research regarding these links. These have not only academic relevance, but potentially also have repercussions for major policy-making and for improving stakeholder participation in water management.

Chapter 4:

A Structural Equation Model of Value Landscapes and their Effect on Public Preferences in Water Governance

4.1 Introduction

As outlined on multiple occasions throughout this PhD thesis, several recent publications have argued that studying values can help to better understand water governance, may potentially contribute to mitigating conflicts in water governance, as well as help to assess the political legitimacy of water-related decisions (Glenk & Fischer 2010; Groenfeldt & Schmidt 2013; Hermans, Kadigi, et al. 2006; Ioris 2012a). There are a number of alternative theoretical conceptualisations of values, typically delimited by disciplinary boundaries (Dietz et al. 2005; Ioris 2012a; Lockwood 1999). Values can be understood as abstract guiding principles that may influence human decision-making, attitudes, and behaviour (Glenk & Fischer 2010; Inglehart 2006; Schwartz et al. 2012) or alternatively, as values assigned to objects and places, for example water resources (Seymour et al. 2011), nowadays often conceptualized as water ecosystem services (Grizzetti, Lanzanova, et al. 2016; Hackbart et al. 2017; Martin-Ortega, Ferrier, & Gordon 2015).

In this context, the novel conceptual framework proposed earlier suggests that empirical studies of the values underpinning water governance can provide a better understanding, and eventually pathways for resolution, of water-related conflicts. The complex relationships between different types of values and their links with water governance can be metaphorically described as value landscapes. The research presented in this chapter represents a first attempt to empirically test the value landscapes approach using a quantitative method. Specifically, structural equation modelling (SEM) is employed, which serves to uncover complex relationships between latent constructs such as values (Garson 2015; Kline 2011). This is likely the only study using SEM to investigate links between

values and public preferences in water governance, with the exception of Glenk and Fischer (2010), although their study had a different theoretical motivation. Eliciting public preferences in this way, in conjunction with underlying values, may not only contribute to an enhanced understanding of preferences, but may serve to evaluate the political legitimacy of water governance more generally.

The present quantitative study applies the value landscapes approach to the case of the Paraguay-Paraná Waterway, i.e. the same case study that was used to illustrate the novel conceptual framework in the previous chapter and had suggested the existence of two opposing value landscapes among stakeholders in the area. It aims at studying value landscapes of a representative sample of members of the public in the affected Upper Paraguay River Basin in Mato Grosso, Brazil, to uncover the value base that informs preferences about and opinions on this controversial infrastructure and water governance project.

Apart from the general contribution to research on the links between values and water governance preferences and empirical validation of value- and governance-related theories, this study seeks to measure and verify the existence of two opposing value landscapes in relation to the waterway more specifically. As it is the first study to offer a systematic analysis of public preferences and levels of public support for this project, it could potentially have high policy relevance as an indication of its democratic legitimacy. It thus complements existing research on the waterway, which has discussed stakeholders' and water professionals' views (chapter 3; Leão et al. 2013), advocated the waterway from an engineering and economic point of view (Pires & da Silva 2009) or investigated the potential ecological and hydrological impacts of the waterway on the Pantanal (Gottgens et al. 2001; Hamilton 1999; Junk et al. 2006). Given the Pantanal's status as a global natural heritage recognised e.g. by UNESCO or the Ramsar Convention (Calheiros et al. 2012), as well as the global trade links of Mato Grosso's

agribusiness and soybean sector (Peine 2013), the research is of relevance beyond the immediate case study area.

4.2 Value landscapes and their impact on preferences in water governance

In line with the conceptual framework, it is expected that people's values inform their preferences regarding water governance and that values are interrelated in a hierarchical structure, in which the more abstract fundamental values may determine people's governance-related values and assigned values, but not vice versa (see also Brown 1984; Glenk & Fischer 2010; Seymour et al. 2010). After providing a brief background, this section proposes a number of hypotheses which apply these theoretical expectations to the case study, the plans for building a waterway through the Pantanal wetland in the state of Mato Grosso, Brazil, building on the qualitative exploratory research presented in the previous chapter.

As explained there, the Paraguay-Paraná Waterway is a controversial infrastructure project with a long history of conflict between various stakeholder groups that concern the potential impacts of shipping and major engineering modifications close to its proposed starting point in Cáceres, Mato Grosso, on the ecosystem and livelihoods of local people in the Pantanal wetland (Calheiros et al. 2012; Leão et al. 2013). Two opposing value landscapes consisting of a number of governance-related values and assigned values that were related to a tendency to either support or oppose the project were identified in the qualitative research stage. One value landscape consisted of a cluster of governance-related values such as efficiency, pragmatism, and order (in the sense of legal certainty, security, and the ability to plan more generally), which relate well to a general vision of Mato Grosso as a place of strong economic development and growth. These governance-related values were complemented with assigned values such as navigation, agriculture, tourism, and aquaculture, i.e. mostly economic water values. Values of this first value landscape were typically expressed by supporters

of the waterway, especially representatives of the agribusiness sector. A second value landscape emerged with an alternative focus on governance-related values such as equity, social justice, conservation/tradition and solidarity, and assigned values mostly related to culture, such as subsistence fishing, traditional festivities along the rivers, aesthetic values, as well as ecological values of water. This value landscape was closely associated with opposition to the waterway and typically found among traditional fishermen and local people in the Pantanal, as well as NGO activists and academics opposed to the project.

Combining the theoretical insights of the value landscapes approach and the first empirical findings of the earlier qualitative study, the quantitative study presented here sought to investigate the following alternative hypotheses:

1) We can identify meaningful relationships among the three different types of values (fundamental values, governance-related values, and assigned values) that reflect their hierarchical structure, with fundamental values being the most abstract construct 'predicting' both governance-related values and assigned values.
2) There is a measurable impact of people's value landscapes on their preferences in water governance.
3) There are different value landscapes consisting of various clusters of values that relate either positively or negatively with the likelihood to support the construction of the Paraguay-Paraná Waterway.

4.3 Methodological approach

4.3.1 Structural equation modelling

Structural equation modelling (SEM) is a research method that allows empirical testing of complex theoretical relationships between multiple variables, including latent variables such as people's values, combining a number of multivariate statistical techniques. It has an origin in fields as diverse as genetics, sociology,

economics, and psychology and, since the 1970s, has evolved into a popular research method in the wider social sciences (Rosseel 2012). Specifically, SEM studies typically combine path analysis (to test hypothesised causal structures between variables) and confirmatory factor analysis (to measure latent variables using several observed indicators).

The benefits of using SEM to understand the role of values and other latent variables for public preferences on the one hand, and motivations for actors in water governance and water management on the other hand, have been highlighted in a number of recent studies. For example, Ford et al. (2009) suggest that members of the public tend to accept clearfell harvesting in Tasmanian forests more readily if they perceive forests in terms of their use value, e.g. for timber, and tend to oppose it when they perceive forests in terms of their non-use value, as components of the natural environment. In the field of water management, several studies have explored the role of various perceptions, attitudes and beliefs for adopting water conservation practices, especially among farmers (Tang et al. 2015; Yazdanpanah et al. 2014) and landowners (Pradhananga et al. 2015). Van Meerkerk et al. (2015) identified democratic (throughput) legitimacy as an important mediating factor in the positive relationship between water governance network performance and levels of connective management activities. Finally, Glenk and Fischer (2010) found significant paths in their exploration of links between fundamental values, governance-related values, beliefs, attitudes, and preferences for flood risk mitigation policies among members of the Scottish public. For example, people who value solidarity are more likely to trust the government and would prefer a council insurance mechanism to cope with potential damages from floods and water shortages. In the research presented here, SEM is employed to measure and empirically test the existence of value landscapes and their impact on preferences in water governance (i.e. support or opposition to the plans of constructing the Paraguay-Paraná Waterway in Mato Grosso).

4.3.2 The sample

The structural equation model relies on survey data collected among members of the general public (n=1067) in the Upper Paraguay River Basin in Mato Grosso between April and June 2016. The Paraguay-Paraná Waterway would be constructed in this hydrographic area, which also encompasses large parts of the Pantanal wetland as well as major population centres of Mato Grosso, such as the state capital Cuiabá. The exact boundaries of the river basin were identified using a map from the Brazilian National Water Agency (ANA 2006).

Sampling occurred during two stages. First, at the census tract level and second, at the household level. A list of all 2998 census tracts within the hydrographic area was compiled, using a sampling frame composed of data from the most recent demographic census of the Brazilian Institute for Geography and Statistics (IBGE 2011a). Census tracts are the smallest geographical units defined by the IBGE for the entire Brazilian territory and were introduced specifically with the purpose of allowing household sampling (IBGE 2011b). They typically comprise between 150 and 400 households and thus represent one (part of a) neighbourhood or rural area. 40 census tracts were randomly sampled (see Figure 4.1 for their locations within the Upper Paraguay River Basin)[14], taking into account differing census tract population sizes using probability proportionate to size sampling following the procedure described in Turner (2003). This meant that more densely populated census tracts were more likely to be sampled, thus approximating representativeness as well as possible. One of the consequences of this sampling method is implicit stratification according to geographical location, i.e. sampled census tracts would be spread out within various municipalities of the Upper Paraguay River Basin. At the same time, the largest number of interviews would be conducted in the more densely populated municipalities (and census tracts) of Cuiabá and Várzea Grande.

[14] See appendix A.1 for the full list of sampled census tracts.

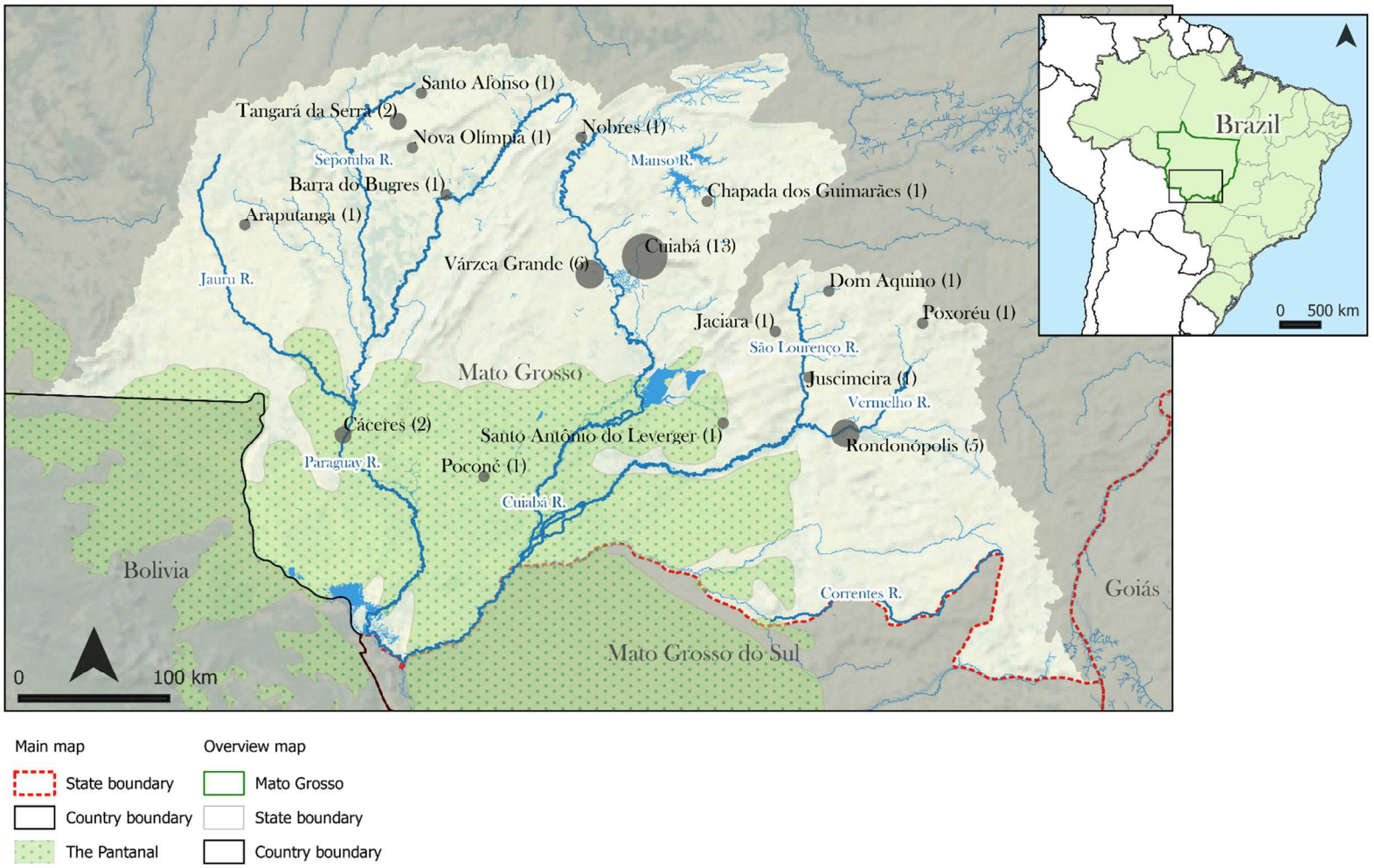

Figure 4.1: Sampled census tracts in the Upper Paraguay River Basin, Mato Grosso; numbers indicate the number of sampled census tracts per municipality (source of city locations, rivers, waterbodies: © OpenStreetMap contributors; Pantanal: Olson et al. 2001)

30 addresses were randomly sampled within census tracts, using address lists provided by IBGE as sampling frames (2011c). Generally at least two attempts were made to interview a member of a specific household thus selected. In case of repeated non-response, replacement rules were in place which defined how to randomly select an alternative household from the respective address list. Within-household selection of interviewees was determined by the household after ruling out the quasi-probabilistic last-birthday method (Gaziano 2005; Salmon & Nichols 1983) to reduce time spent at a property, as is commonly done in survey research (Gaziano 2005).

Interviews typically took between 15 and 30 minutes and each interviewer completed 6-8 interviews per day, this way giving sufficient time for identifying respondents and flexible interview lengths. Interviewers also had instructions to avoid interviewing neighbours, as well as family members of an interviewee wherever possible, and to avoid interviewing more than one person per household or persons under the age of 18 under all circumstances. All in all, 1067 valid survey responses were obtained in 39 census tracts. One census tract had to be excluded as no access permission was given, a section of Alphaville in Cuiabá, a gated community exclusively populated by the wealthiest members of the local elite.[15] Other logistical reasons account for further missing responses, e.g. where census tracts were very small or no access permission to an individual multi-storey building within a census tract could be obtained.

Interviews were typically conducted between 9 am and 6 pm. For the security of interviewers, interviews after sunset were avoided except in a few exceptional circumstances. Yet, in principle interviewing after sunset would have been desirable to achieve a higher probability of encountering working people, especially male respondents, at home. A special effort was made to conduct as

[15] See Romancini (2011) for a description and discussion of the development of gated communities in Cuiabá.

many interviews as possible during weekends to mitigate a sampling bias towards the unemployed and female homemakers (this only applies to urban census tracts, as in rural areas people would generally have the same working schedule every day). Overall, 39.05% of interviews in urban census tracts took place on weekends.

Sample size was deliberately large, as SEM typically requires sample sizes of at least 200 (Garson 2015) and should be increased with increasing model complexity; Kline (2011) recommends a minimum ratio of 10 observations per freely estimated parameter. In the case of non-normally distributed ordinal and categorical data, estimation methods such as categorical diagonally weighted least squares (cat-DWLS) typically show their best performance for a variety of structural equation models at large sample sizes of 1000, although a number of factors determine optimal sample size, including model (mis-)specification and data asymmetry (Bandalos 2014).

To assess the representativeness of the sample, socio-demographic characteristics of respondents were compared with data from the 2010 IBGE census (see Table 4.1). The sample approximates representativeness as only the difference in proportions for the variable 'occupational status' is statistically significant (see Table 4.2). Logistical reasons account for some minor divergence. For example, a larger proportion of women were interviewed as they are more likely to be home during daytime. A slightly larger proportion of relatively older people between the ages of 45 and 74 were interviewed (and a lower proportion of younger people below the age of 45). This was possibly again owed to the fact that younger people were more likely to be away from home during daytime, as well as the fact that the 'head of the household' might be more likely to self-select to attend to a stranger at the door. One-person households were slightly under-sampled, again due to logistical reasons, as at any given point of time one is less likely to encounter a single person at home.

One can only speculate about the considerable divergence in terms of formal education levels; possibly people with lower education levels were more likely to refuse participation. Alternatively, people might have overstated their level of education to avoid embarrassment while participating in a university-affiliated study. The lower proportion of working ('economically active') people in the sample should firstly be owed to the fact that unemployed and not economically active respondents are more likely to be home during daytime. Secondly, it can be explained by the severe economic crisis at the time of conducting the interviews, which had not begun when the IBGE collected its 2010 census data. Unemployment levels in the full population were certainly higher at the time of realising the study, so the data for the entire river basin are not an optimal reference point and may explain why the difference between the proportions was statistically significant. With regard to monthly household income, again one can only speculate about the reasons for the strong divergence between sample and population in the lowest two income categories. These reasons may be similar to those explaining divergence in formal education levels, i.e. respondents earning less than one minimum salary per household may have opted to select the category of 1-2 salaries instead. The lower proportion of respondents in the lowest income category is especially surprising, considering the rise of the minimum salary from R$ 510 in 2010 to R$ 880 in 2016. The lower proportion of respondents in the two highest income categories, in turn, is less surprising as such respondents are typically reluctant to disclose their income. It can thus be assumed that some of these respondents could be found within the "refused" category.[16]

[16] IBGE does not report refusal rates as all missing data is imputed; responses that are deemed 'untypical' are replaces with imputed data as well, using advanced standardised procedures (IBGE 2012).

Table 4.1: Representativeness of sample

		Sample	Upper Paraguay River Basin (UPRB)
Location[17]	Urban	92.9%	89.3%
	Rural	7.1%	10.7%
Gender[4]	Male	40.6%	49.7%
	Female	59.4%	50.3%
Age[4]	18-19	3.9%	5.2%
	20-24	8.6%	13.7%
	25-29	8.3%	13.4%
	30-34	11.5%	12.6%
	35-39	9.4%	11.1%
	40-44	9.7%	10.0%
	45-49	9.9%	8.7%
	50-54	8.6%	7.3%
	55-59	9.7%	5.6%
	60-64	6.6%	4.3%
	65-69	6.7%	3.1%
	70-74	4.0%	2.2%
	75 or more	2.9%	2.8%
	Refused	0.1%	-
Household size[18]	1 resident	7.6%	12.7%
	2 residents	23.0%	21.7%
	3 residents	25.1%	24.2%
	4 residents	21.0%	22.1%
	5 residents	12.7%	11.3%
	6 or more residents	10.6%	7.9%
Formal education[19]	No formal schooling / incomplete primary school	28.6%	42.2%
	Primary school complete / incomplete high school	17.6%	17.0%
	High school complete / incomplete higher education	38.0%	29.5%
	Complete higher education	15.8%	11.4%
Occupational status[20]	Economically active	50.8%	69.3%
	Not economically active	49.2%	30.7%

[17] Source: Table No. 1552, Census of 2010, IBGE, Rio de Janeiro (accessed through http://www2.sidra.ibge.gov.br). Numbers for the UPRB were compiled using data at the district level for adults (18 years or older); see appendix A.2 for the exact list of districts.

[18] Source: Table No. 3219, Census of 2010, IBGE, Rio de Janeiro (accessed through http://www2.sidra.ibge.gov.br). Numbers for the UPRB were compiled using data at the district level; see appendix A.2 for the exact list of districts.

[19] Source: Table No. 3540, Census of 2010, IBGE, Rio de Janeiro (accessed through http://www2.sidra.ibge.gov.br). Numbers for the UPRB were compiled using data at the level of municipalities for adults (18 years or older); see appendix A.3 for the exact list of municipalities.

[20] Source: Table No. 616, Census of 2010, IBGE, Rio de Janeiro (accessed through http://www2.sidra.ibge.gov.br). Numbers for the UPRB were compiled using data at the level of municipalities for adults (18 years or older); see appendix A.3 for the exact list of municipalities.

Monthly household income[21]	Up to 1 minimum salary	8.6%	16.7%
	1-2 minimum salaries	34.7%	20.5%
	2-5 minimum salaries	33.8%	36.5%
	5-10 minimum salaries	10.0%	16.4%
	10-20 minimum salaries	5.2%	6.8%
	More than 20 minimum salaries	1.1%	3.1%
	Refused	4.8%	-
	Don't know	1.7%	-

*Table 4.2: Pearson χ^2 test of difference – sample vs Upper Paraguay River Basin (UPRB); ** Difference between sample and UPRB is significant at the 0.01 level (2-sided).*

Variable	χ^2	Degrees of freedom (df)	p-value
Location	0.799	1	0.371
Gender	1.672	1	0.196
Age	6.408	12	0.894
Household size	1.839	5	0.871
Formal education	4.405	3	0.221
Occupational status**	**7.133**	**1**	**0.008**
Monthly household income	9.112	5	0.105

4.3.3 Questionnaire design

The questionnaire used in the survey consisted of seven sections, five of which were analysed for the present study (with remaining sections to be analysed in further research).[22] These were a section on socio-demographic variables, a section on fundamental values, governance-related values and assigned values each, to 'map' a respondents' value landscape, and a section that sought to capture the respondents' views on various water governance projects in Mato Grosso, including the Paraguay-Paraná Waterway.

To measure a respondent's fundamental values, Schwartz' universal value framework was employed, and specifically, the Portrait Value Questionnaire with 21 items introduced by Schwartz (2001). It has been translated into Portuguese for the European Social Science Survey.[23] The 21-item measurement instrument

[21] Source: Table No. 3562, Census of 2010, IBGE, Rio de Janeiro (accessed through http://www2.sidra.ibge.gov.br). Numbers for the UPRB were compiled using data at the level of municipalities; see appendix A.3 for the exact list of municipalities. Note that in 2010, a minimum salary was R$ 510, whereas in 2016, it was R$ 880.

[22] See appendix B.1 for the full original questionnaire, and appendix B.2 for a translation into English.

[23] Some minor changes had to be made to adapt the original wording from European Portuguese into Brazilian Portuguese during a piloting stage.

was chosen to permit having more than one item per fundamental value (i.e. two each; three for universalism), without adding too much length to the interview duration that would have been necessary for more detailed versions of the Schwartz Survey. Furthermore, it has been developed specifically in view of facilitating easy application to any type of respondent (e.g. varying levels of age, education, cultural background etc.).

Respondents are read a brief two-sentence description of an imaginary person and are then asked to state whether they feel that the description is 'very much like them' to 'not like them at all' on a 6-point scale. Each description carries a distinct fundamental value, for example, achievement: "Being very successful is important to her/him. She/he likes to impress other people." (Schwartz 2001: 273). The Schwartz Survey was chosen, rather than a different framework for fundamental values, due to its universal relevance for decision-making in general, which fits the conceptualisation of fundamental values as the most abstract and general principles well. The fact that it has been tested and validated in numerous studies across the globe, including in Brazil (Tamayo & Porto 2009), was another argument in favour.

With regards to governance-related values and assigned values, it was not possible to make use of existing measurement instruments. Despite numerous case studies on individual values such as sustainability, social justice or efficiency as cited earlier (see p. 44), Glenk & Fischer (2010) note a lack of quantitative research on governance-related values, especially in the environmental economics and psychology literature. In the absence of an established comprehensive governance-related values theory and associated measurement instruments, it is thus left to individual researchers to define their own set of governance-related values to be studied on a case by case basis. Assigned values have been measured using a wide range of methods from focus group research to survey approaches, but due to their variability and context-specific nature, their classification and

measurement is usually customised to fit the specific research context at hand (Seymour et al. 2010).

Thus the study relied on the list of values identified in the exploratory study with local stakeholders to design the survey items, assuming that these would be appropriate in the local context. A list of six assigned value items and seven governance-related value items was compiled (see Tables 4.3 and 4.4). Assigned values cover three broad areas of values, i.e. cultural water values, economic water values, and ecological water values, since these were listed in the previous chapter as pertaining to two opposing value landscapes, with cultural and ecological values both falling into the category of non-economic values. The specific items make reference to local water values in the Upper Paraguay River Basin, such as traditional lifestyles or the nature of the Pantanal wetland. Having more items per type of assigned value would have been desirable, but again there were limits imposed by the practical reality of implementing a survey with limited time at people's homes.

Analogous to assigned values, the formulation of governance-related value items was based on the previous exploratory study, in which democratic legitimacy, social justice, economic efficiency, rule of law/order, sustainability, evidence-based policy-making, and public participation had been repeatedly mentioned as desirable by local stakeholders. Their categorisation into broader categories was less straightforward. Given the lack of quantitative studies on people's governance-related values, these were classified into broader categories using exploratory factor analysis (see section 4.4.1 below). In the application of the questionnaire, respondents were first asked to pick their most important assigned value or governance-related value, respectively, to make them familiar with the entire list of items. Then, they were asked to state whether the remaining other items were 'equally important' to 'not important' on a 5-point scale, item per item. The list of assigned value items was introduced as 'reasons why the rivers and

waterbodies of Mato Grosso are important'; the list of governance-related value items was introduced as 'principles that could guide the authorities when they take decisions about water.'

Table 4.3: Assigned values: list of items

Cultural water values	Traditional lifestyles, for example artisanal fishing or use of clay for ceramics, depend on rivers.
	Mato Grosso's culture has a strong relationship with the rivers and waterbodies, for example during traditional festivities.
Economic water values	The state's economy depends on water abundance, especially for agriculture and cattle ranching.
	The rivers produce almost all electric energy that is used in Mato Grosso.
Ecological water values	The rivers sustain the nature of the Pantanal wetland.
	The rivers and waterbodies are important for the survival of wildlife, for example jaguars, birds, caimans etc.

Table 4.4: Governance-related values: list of items

Democratic governance values (democratic legitimacy and social justice)	Follow the opinion of the majority of the population.
	Care about the poor and minorities.
Economic governance values (economic efficiency and rule of law/order)	Not to waste public money.
	Everyone follows the law.
Scientific governance values (sustainability and evidence-based policy-making)	Think about the impact for future generations.
	Consult studies and experts.
Public participation (discarded; see 4.4.1)	Ensure the political participation of those that are affected.

Finally, the questionnaire contained an extensive section that sought to understand people's preferences and views on various water governance issues in Mato Grosso, which again were all based on the previous qualitative fieldwork. Here, a focus is placed on the question whether respondents would support or oppose the waterway if a hypothetical referendum was held about its construction. This question was preceded by a brief description of the controversy that aimed to be as neutral and balanced as possible, citing advantages and disadvantages that have been mentioned in the media, academic literature, and in stakeholder interviews.

The questionnaire underwent extensive testing and numerous rounds of revisions, including with randomly selected students at the Federal University of Mato

Grosso and members of the general public to identify any issues and sources of confusion. Finally, respondent selection procedures using address lists (and maps) of IBGE as described in 4.3.2 above, as well as application of the final questionnaire were tested in a simulation of the actual survey in a pilot study in the middle-class neighbourhood of Recanto dos Pássaros in Cuiabá, involving nine interviewers and 21 conducted interviews.

4.4 Results

4.4.1 Exploratory factor analysis of assigned values and governance-related values

Since a new measurement instrument had to be developed for assigned values and governance-related values, exploratory factor analysis (EFA) was employed to establish how many latent variables the survey items captured and whether they represented distinct factors. This was done for assigned values and governance-related values separately.[24] For assigned values, there were strong theoretical expectations, namely that the survey items measured three distinct types of assigned values (cultural, ecological, and economic water values), but an EFA was carried out in any case as the items had not been tested for the existence of latent variables previously. For governance-related values, there were no specific theoretical expectations due to the lack of previous research, and the approach was fully exploratory. For the EFA, IBM SPSS (v.22) was used, first with the six assigned value items, then with the six governance-related value items.[25] As a factor extraction method, principal axis factoring (also known as 'principal factors') was

[24] An EFA with all indicators/items at once produces two factors: the first consisting of all assigned value items, and the second consisting of all governance-related items; this merely shows that all assigned value items indeed measure 'water values', and all governance-related value items indeed measure 'good governance'. For the study here, more detail was judged more useful, despite the criticism of van der Eijk & Rose (2015) and C. van der Eijk (personal communication, March 23, 2017) who warn about the risk of 'over-dimensionalisation' from a data point of view.

[25] It should also be noted that the item 'public participation' was excluded from the analysis as interviewers had reported high levels of confusion around it; the concept of 'political participation' mentioned in its text was not sufficiently clear to a significant number of respondents. Thus the reliability of the data for this individual item could not be trusted.

selected, which according to Brown (2006) and Fabrigar et al. (1999) is less prone to improper solutions and does not require distributional assumptions regarding the data. Another advantage of principal axis factoring is that it is more sensitive in the extraction of weaker factors and everything else being equal, almost always outperforms maximum likelihood factor analysis (de Winter & Dodou 2012).

To determine the number of factors, the 'scree test' was employed, which involves plotting the initial eigenvalues of the factors against the number of factors (Brown 2006; Costello & Osborne 2005). It has been suggested as an alternative to the popular, but somewhat arbitrary Kaiser-Guttman rule, which merely defines that additional factors with eigenvalues below 1.0 should be disregarded, thus often producing inaccurate results (Bandalos & Boehm-Kaufman 2009). The plot is then inspected to identify the last substantial decline in the magnitude of eigenvalues to determine a cut-off point for the number of factors to be extracted. As a factor rotation method, 'promax' with Kaiser Normalisation was selected, i.e. an oblique rotation method that allows latent variables to intercorrelate. This is opposed to orthogonal rotation methods such as 'varimax', which would constrain factors to be fully uncorrelated (Costello & Osborne 2005), which was deemed inappropriate for this case, as e.g. some correlation between cultural and ecological water values could be expected. Factor rotation represents a mathematical transformation of the data which increases their interpretability as it selects those solutions among the infinite number of factor solutions in which factor loadings are closer to 1 and more distant from 0, respectively (Brown 2006).

For the EFA of assigned values, the last substantial decline was found in the magnitude of eigenvalues at around 0.8, thus producing three latent variables or factors. Table 4.5 shows the rotated pattern matrix, i.e. the unique relationships between factors and items ('factor loadings'), with factors serving as predictors of the items (or 'indicators'). While there is no consensus in the literature what represents appropriate cut-off points for factor loadings (Peterson 2000), the

results indicate quite unambiguously the existence of three separate types of water values, measured by two items each. Factor 1 in the table can be interpreted as 'ecological water values', factor 2 as 'cultural water values' and factor 3 as 'economic water values' as each one of them has relatively high loadings on two items and consistently low loadings on the remaining four items. While the results are not necessarily surprising, they confirm that the measurement of assigned values was indeed appropriate. The weakest loading is found with the item mentioning economic water values, agriculture, and cattle ranching on the factor 'economic water values'. From a conceptual point of view, this is probably due to the fact that some respondents related hydroelectric power production, the second constitutive item for 'economic water values', more with personal consumption than with its economic value creation. This added some 'noise' to the data, caused by the multidimensionality of that item. However, the loading of 0.428 is still relatively high, thus 'economic water values' is kept as a separate latent variable in the analysis.

Table 4.5: Rotated pattern matrix of EFA with assigned values

ASSIGNED VALUE ITEMS	EXTRACTED FACTORS		
	1 (Ecological water values)	2 (Cultural water values)	3 (Economic water values)
Relative importance of traditional lifestyles, including artisanal fishing	.026	.540	.046
Relative importance of the economy and agriculture	.032	.104	.428
Relative importance of nature and the Pantanal	.604	.013	.051
Relative importance of cultural values, including traditional festivities	-.025	.663	-.038
Relative importance of hydroelectric power production	-.028	-.058	.568
Relative importance of wildlife, e.g. jaguars, birds, caimans	.652	-.015	-.052

For the EFA of governance-related values, the last substantial decline in the magnitude of eigenvalues was found at around 0.9, thus again producing three latent variables. Table 4.6 shows the respective pattern matrix. Similar to the table for assigned values, one can find three separate factors with two items as indicators

each that load relatively highly on them, but not on the remaining factors. Factor 1 was named 'democratic governance (values)' as it is composed of values emphasising the role of constituents and members of the public. Factor 2 was named 'scientific governance (values)' as it emphasises the role of experts directly and indirectly: Directly, through the item 'evidence-based policy-making' and indirectly, through the item 'sustainability', which usually requires some expert input (to determine long-term impacts). Factor 3 was named 'economic governance (values)' as it consists of economic efficiency on the one hand, and the rule of law/order on the other hand, which are both governance-related values that are of importance to businesses and the economically active. These labels are given for convenience (to avoid referring to 'factor 3' or 'factor rule of law + economic efficiency') and are not expected to represent a perfect fit. This is normal in an EFA as one cannot anticipate which items are going to jointly form latent factors (hence 'exploratory' as opposed to 'confirmatory' factor analysis). The fully exploratory nature of the procedure may also explain why factor loadings for factors 2 and 3 are lower than the factor loadings for assigned values above; however, they are still sufficiently high to justify inclusion of constructs in the subsequent structural equation model.

Table 4.6: Rotated pattern matrix of EFA with governance-related values

GOVERNANCE-RELATED VALUE ITEMS	EXTRACTED FACTORS		
	1 (Democratic governance values)	2 (Scientific governance values)	3 (Economic governance values)
Relative importance of sustainability (care about future generations)	.020	.423	-.051
Relative importance of economic efficiency (no waste of public money)	.053	-.057	.350
Relative importance of democratic legitimacy (majority rule)	.547	.092	-.089
Relative importance of evidence-based policy-making (through expert consultation)	.029	.345	.107
Relative importance of social justice (care for the poor and minorities)	.448	-.086	.191
Relative importance of the rule of law	-.053	.137	.389

4.4.2 Correlations among fundamental value dimensions

For fundamental values, instead of applying an EFA, the guidelines provided in Schwartz and Littrell (2009) were followed, i.e. the higher-order fundamental value dimensions of openness to change, conservation[26], self-transcendence, and self-enhancement were correlated, mostly to check whether the collected data behaved as one would expect theoretically (see Table 4.7). For this purpose, individual responses were mean-centred to account for different response patterns by different survey respondents, and an index built that calculated the average score for each of the four dimensions.[27] As can be seen, self-transcendence and self-enhancement as opposing pairs of dimensions are indeed negatively correlated, as are conservation and openness to change, representing the second pair of opposing dimensions. Interestingly, conservation and self-enhancement are also strongly negatively correlated, which given that they are separate dimensions is not an issue beyond the fact that the coefficient is higher than expected. The same could be said about conservation and self-transcendence, which appear not to have a significant relationship; but given that they are neighbouring dimensions, one would not have strong expectations about their relationship in any case.

*Table 4.7: Correlations between fundamental value dimensions; ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).*

		Openness to change	Self-transcendence	Conservation	Self-enhancement
Openness to change	Pearson Correlation	1			
	Sig. (2-tailed)				
Self-transcendence	Pearson Correlation	-.263**	1		
	Sig. (2-tailed)	.000			

[26] Conservation is to be understood in the sense of 'being conservative', not as 'environmental conservation'.

[27] It should be noted that in the following SEM, raw data (i.e. not mean-centred or averaged) was used as there is no benefit to mean-centring in CFA/SEM (Schwartz & Littrell 2009) and taking the average value of a group of items (i.e. item-parcelling) always goes along with a loss of information; not to mention that it is a controversial practice with Likert-scale items, which are ordinal, not continuous (Yang et al. 2010).

Conservation	Pearson Correlation	-.539**	.049	1	
	Sig. (2-tailed)	.000	.115		
Self-enhancement	Pearson Correlation	-.075*	-.566**	-.556**	1
	Sig. (2-tailed)	.015	.000	.000	

4.4.3 Confirmatory factor analysis

Confirmatory factor analyses (CFA) were conducted to test the quality of each of the three measurement models for assigned values, governance-related values, and fundamental values, respectively, and to establish construct validity, using the lavaan package in R (v. 0.5-23.1097).[28] Missing cases were deleted listwise, which affected no more than 3.94% of overall observations at any point, which is below the 5% threshold that Garson (2015) recommends for using listwise deletion. Rates of missing values could overall be kept quite low as interviewers had been trained in probing techniques, such as reassuring the respondent that there were no right or wrong answers when noticing that they were hesitant to pick an answer. Having ordinal data, polychoric correlations were used for this analysis, which assume that an underlying continuous variable is measured in a number of discrete categories (Garson 2015); a plausible assumption for people's values. Furthermore, diagonally weighted least squares (DWLS) was applied as a model estimation method, which is appropriate for categorical (ordinal) data with sample sizes of around 1000 (Bandalos 2014).

To evaluate model fit, a combination of fit indexes was relied upon as is widely recommended in the CFA and SEM literature (Brown 2006; Garson 2015; Kline 2011). Specifically, the root mean square error of approximation (RMSEA), the standardised root mean squared residual (SRMR), Bentler's Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI) were evaluated, which are all discussed in Hu and Bentler (1999), as well as the traditional model χ^2 significance/p value, following recommendations of Garson (2015) and Hooper

[28] See Rosseel (2017) for an overview.

et al. (2008). While an extensive discussion of the advantages and disadvantages of each of these indexes is beyond the scope of the present study, it should be noted that model χ^2, RMSEA and SRMR are based on predicted vs. observed covariances, while CFI and TLI involve comparisons with a null model. The first group of indexes thus verify how well the covariance matrix resulting from the specified model can reproduce the observed covariance matrix and are also called 'absolute fit indexes'; whereas CFI and TLI are 'incremental fit indexes', i.e. they measure how much the specified model improves on a null model, which represents the worst possible fit (Garson 2015; Kline 2011).

Model χ^2 measures the discrepancy between the observed and model-predicted covariance matrices; ideally, this discrepancy should not be significant. However, model χ^2 is sensitive to sample size and it has been suggested that it rejects most models with sample sizes above 200. This has led many researchers to ignore it when other fit measures indicate good fit (Garson 2015; Hooper et al. 2008), although the issue remains controversial (Barrett 2007; Kline 2011). RMSEA is almost universally cited in CFA and SEM studies and generally considered to be acceptable at 0.06 or lower (Hu & Bentler 1999). Hooper et al. (2008) state that it is sensitive to the number of estimated parameters in the model, and favours more parsimonious models, one of the main reasons for its high popularity. Yet Mulaik (2009) finds no association between RMSEA and model parsimony, so this claim remains disputed. Kline (2011) recommends reporting RMSEA with a 90% confidence interval. SRMR is recommended to fall below a cut-off value of 0.8 (Hu & Bentler 1999); the lower it is, the lower the covariance residuals, i.e. the differences between the observed and predicted covariances (Kline 2011). CFI and TLI should both be 0.95 or higher (Hu & Bentler 1999), indicating that 95% of the covariation in the data can be reproduced by the specified model as opposed to a null model in which indicator variables are uncorrelated (Garson

2015). CFI and TLI are not affected by sample size, and TLI additionally penalises for parsimony.

Finally, it should be noted that some authors have cautioned against the use of cut-off criteria in general as they are 'rules of thumb' rather than universally valid numbers and their usefulness may vary according to the concrete research context. Kline (2011) for example mentions that Hu and Bentler's (1999) list of cut-off criteria should have never become a widely used reference for what constitutes 'good model fit'. Barrett (2007) suggests model fit indexes should be abandoned altogether. However, in the absence of better alternatives, it seems appropriate to report whether model fit indexes found here do or do not fall within the widely used guidelines, rather than to ignore them altogether, both for CFA and the following SEM (section 4.5 below). All models are also discussed from a substantive perspective, i.e. discussing their actual meaning, instead of relying on purely data-driven strategies, such as the application of modification indexes. These indexes tell the researcher how to improve model χ^2 by adding links to the model, devoid of any theoretical considerations. In focusing on substantive meanings instead, the recommendations of even the harshest critics of fit indexes are in fact implemented (Barrett 2007).

A CFA of the fundamental value items indicates acceptable model fit overall (see Table 4.8), although model χ^2 is significant, possibly due to the large sample size. However, problems can be found with the measurement of the fundamental value 'stimulation'. Item 'stimulation 2' is not significant with a p-value of 0.089 and the factor loading of 'stimulation 1' on stimulation is unusually high (1.315). The first item aimed to measure respondents' appreciation of surprises and the second item measured their willingness to take risks. Evidently, the risk-seeking item was not suitable for the local context in Mato Grosso, as risk-seeking in an environment with very high levels of crime and a society in deep political and economic crisis was perceived to be ironic (a large proportion of respondents

literally laughed at the question). It thus understandably did not form a common latent variable with an appreciation of surprises. This fundamental value was thus excluded from the analysis altogether. Further issues can be found when studying standardised covariances (i.e. correlations) of various values: the fundamental value 'tradition' has two correlations with values beyond 1 (with universalism and conformity). This again indicates problems with its measurement, although finding a substantive explanation is less straightforward than in the case of the fundamental value 'stimulation'. Notably, there is also a very high correlation between universalism and benevolence, suggesting that these could have been modelled as one latent variable rather than two. As noted earlier in section 4.4.2, the Schwartz value framework contains four meta-categories or higher-order dimensions, and universalism and benevolence fall jointly into the meta-category of self-transcendence, although Schwartz and Boehnke (2004) note that alternative meta-categorisations are possible.

Table 4.8: CFA fundamental values; see appendix C.1 for the lavaan code and full summary.

N (used)	χ^2	df (degrees of freedom)	P-value (χ^2)	CFI	TLI	RMSEA	90% conf. int. (RMSEA)	SRMR
1051	641.897	144	0.000	0.968	0.953	0.057	0.053, 0.062	0.053

LATENT VARIABLES

Latent variable	Item/indicator	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Universalism	universalism 1	1 (fixed)				0.566
	universalism 2	0.982	0.062	15.836	0.000	0.556
	universalism 3	1.281	0.069	18.679	0.000	0.725
Benevolence	benevolence 1	1 (fixed)				0.723
	benevolence 2	0.995	0.040	24.682	0.000	0.719
Conformity	conformity 1	1 (fixed)				0.388
	conformity 2	1.240	0.133	9.333	0.000	0.481
Tradition	tradition 1	1 (fixed)				0.656
	tradition 2	0.750	0.038	19.649	0.000	0.492
Security	security 1	1 (fixed)				0.664
	security 2	0.964	0.049	19.574	0.000	0.640
Power	power 1	1 (fixed)				0.477
	power 2	1.052	0.129	8.159	0.000	0.501
Achievement	achievement 1	1 (fixed)				0.644
	achievement 2	1.249	0.083	14.976	0.000	0.804
Hedonism	hedonism 1	1 (fixed)				0.672
	hedonism 2	0.837	0.055	15.342	0.000	0.563
Stimulation	stimulation 1	1 (fixed)				1.315
	stimulation 2	0.120	0.071	1.702	0.089	0.158
Self-direction	self-direction 1	1 (fixed)				0.560

	self-direction 2	0.706	0.079	8.955	0.000	0.395

COVARIANCES

Latent variable 1	Latent variable 2	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Universalism	Benevolence	0.397	0.024	16.829	0.000	0.970
	Conformity	0.142	0.018	8.000	0.000	0.645
	Tradition	0.403	0.024	16.516	0.000	1.086
	Security	0.318	0.023	13.935	0.000	0.844
	Power	-0.070	0.017	-4.047	0.000	-0.260
	Achievement	0.121	0.018	6.862	0.000	0.331
	Hedonism	0.234	0.020	11.555	0.000	0.616
	Stimulation	0.183	0.023	8.053	0.000	0.245
	Self-direction	0.204	0.022	9.176	0.000	0.644
Benevolence	Conformity	0.186	0.023	8.039	0.000	0.664
	Tradition	0.466	0.021	22.048	0.000	0.984
	Security	0.381	0.022	17.602	0.000	0.794
	Power	-0.021	0.022	-0.956	0.339	-0.060
	Achievement	0.146	0.020	7.171	0.000	0.313
	Hedonism	0.324	0.022	14.422	0.000	0.666
	Stimulation	0.190	0.026	7.192	0.000	0.200
	Self-direction	0.316	0.025	12.839	0.000	0.781
Conformity	Tradition	0.264	0.026	10.176	0.000	1.039
	Security	0.205	0.022	9.231	0.000	0.796
	Power	0.047	0.017	2.766	0.006	0.253
	Achievement	0.099	0.016	6.056	0.000	0.397
	Hedonism	0.087	0.019	4.622	0.000	0.334
	Stimulation	0.048	0.020	2.355	0.019	0.094
	Self-direction	0.088	0.019	4.518	0.000	0.403
Tradition	Security	0.386	0.023	16.797	0.000	0.886
	Power	-0.072	0.023	-3.169	0.002	-0.232
	Achievement	0.186	0.022	8.573	0.000	0.440
	Hedonism	0.292	0.023	12.763	0.000	0.663
	Stimulation	0.179	0.029	6.215	0.000	0.208
	Self-direction	0.236	0.025	9.639	0.000	0.644
Security	Power	0.001	0.021	0.054	0.957	0.004
	Achievement	0.203	0.022	9.365	0.000	0.475
	Hedonism	0.265	0.022	11.863	0.000	0.594
	Stimulation	0.212	0.026	8.175	0.000	0.243
	Self-direction	0.219	0.024	9.267	0.000	0.588
Power	Achievement	0.178	0.023	7.597	0.000	0.581
	Hedonism	0.133	0.024	5.664	0.000	0.417
	Stimulation	0.095	0.025	3.787	0.000	0.152
	Self-direction	0.065	0.022	2.927	0.003	0.244
Achievement	Hedonism	0.282	0.023	12.187	0.000	0.651
	Stimulation	0.262	0.024	10.816	0.000	0.310
	Self-direction	0.148	0.022	6.813	0.000	0.410
Hedonism	Stimulation	0.358	0.025	14.314	0.000	0.405
	Self-direction	0.270	0.026	10.542	0.000	0.717
Stimulation	Self-direction	0.259	0.027	9.528	0.000	0.351

Not least because many researchers recommend measuring latent variables with three or more indicators (Brown 2006; Kline 2011), fundamental values were thus measured in the four higher-order dimensions of self-enhancement, self-

transcendence, openness to change, and conservation. A second CFA (excluding 'stimulation') with these produced similar, slightly improved model fit statistics (see Table 4.9). Again, however, issues can be found with individual items. Now, 'power 1' and 'power 2' display very low factor loadings below 0.3 on self-enhancement; 'conformity 1' and 'conformity 2' possess factor loadings below 0.4 on conservation; and 'self-direction 2' loads below 0.4 on openness to change. These items were thus excluded from the analysis as well, using 0.4 as the cut-off point in accordance with Stevens (2009). This means that the indicators used share at least 15% of their variance with the construct.

Item 'power 1' (which is also the only item not to be significant with a p-value of 0.000) related to people's desire to be wealthy, which culturally would have been inappropriate to admit to a stranger.[29] The low loading with self-enhancement can thus be explained, as other forms of self-enhancement (e.g. the 'achievement' items) would not have been controversial from a cultural point of view. The low loadings for conformity might be related to the ambiguity of the items. Some respondents cited that 'behaving properly' and 'avoid doing what people would say is wrong' (both statements are part of item 'conformity 2') were contradictory as 'behaving properly' might involve not listening to other people's opinions. It is not clear whether other applications of the Schwartz Portrait Value Questionnaire faced the same issue; however, this item's formulation should indeed be reconsidered generally, beyond the present individual study. 'Self-direction 2' cited 'not depending on others' as a personal principle to measure self-determination; again some respondents critically remarked that this is an unrealistic formulation as even the most independent person depends on others in some way or another. Yet one can only speculate whether that is the reason for this item's low factor loading on openness to change.

[29] And while no statistical test was performed to prove this, it was found that independent of their income, most respondents would be quick to dismiss any personal interest in wealth, from the poorest to the richest.

Table 4.9: CFA fundamental values (four dimensions); see appendix C.2 for the lavaan code and full summary.

N (used)	χ^2	df (degrees of freedom)	P-value (χ^2)	CFI	TLI	RMSEA	90% conf. int. (RMSEA)	SRMR
1053	581.107	146	0.000	0.969	0.964	0.053	0.049, 0.058	0.055

LATENT VARIABLES

Latent variable	Item/indicator	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Self-transcendence	universalism 1	1 (fixed)				0.565
	universalism 2	0.983	0.063	15.692	0.000	0.556
	universalism 3	1.282	0.070	18.357	0.000	0.725
	benevolence 1	1.258	0.071	17.703	0.000	0.711
	benevolence 2	1.256	0.070	17.875	0.000	0.710
Self-enhancement	achievement 1	1 (fixed)				0.643
	achievement 2	1.300	0.100	13.049	0.000	0.836
	power 1	0.167	0.066	2.530	0.011	0.107
	power 2	0.458	0.057	8.064	0.000	0.295
Openness to change	hedonism 1	1 (fixed)				0.643
	hedonism 2	0.783	0.056	14.102	0.000	0.504
	self-direction 1	0.755	0.057	13.267	0.000	0.486
	self-direction 2	0.560	0.056	10.080	0.000	0.360
Conservation	security 1	1 (fixed)				0.608
	security 2	0.980	0.049	20.133	0.000	0.596
	tradition 1	1.166	0.053	22.17	0.000	0.709
	tradition 2	0.867	0.050	17.389	0.000	0.527
	conformity 1	0.524	0.051	10.272	0.000	0.318
	conformity 2	0.648	0.050	12.958	0.000	0.394

COVARIANCES

Latent variable 1	Latent variable 2	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Self-transcendence	Self-enhancement	0.105	0.015	6.882	0.000	0.288
	Openness to change	0.268	0.020	13.501	0.000	0.736
	Conservation	0.317	0.021	14.935	0.000	0.924
Self-enhancement	Openness to change	0.263	0.023	11.435	0.000	0.635
	Conservation	0.170	0.018	9.353	0.000	0.435
Openness to change	Conservation	0.259	0.019	13.509	0.000	0.661

The third (and final) CFA of fundamental values thus consisted of a reduced set of fundamental value items, having excluded potential sources of measurement error and 'noise'. Model fit statistics are all remarkably better, except model χ^2 significance, again likely due to large sample size (see Table 4.10). One can see a very high correlation between self-transcendence and conservation, which is a bit concerning even though these are neighbouring dimensions. Yet, similar results have been reported before, e.g. in Glenk and Fischer's (2010) SEM study. However, at this stage these two constructs were kept separate as from a conceptual point of view, they are not identical.

Table 4.10: CFA fundamental values (four dimensions) - final version; see appendix C.3 for the lavaan code and full summary.

N (used)	χ^2	df (degrees of freedom)	P-value (χ^2)	CFI	TLI	RMSEA	90% conf. int. (RMSEA)	SRMR
1059	178.588	71	0.000	0.991	0.989	0.038	0.031, 0.045	0.037

LATENT VARIABLES

Latent variable	Item/indicator	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Self-transcendence	universalism 1	1 (fixed)				0.577
	universalism 2	0.974	0.059	16.472	0.000	0.562
	universalism 3	1.263	0.065	19.413	0.000	0.729
	benevolence 1	1.226	0.067	18.375	0.000	0.707
	benevolence 2	1.228	0.066	18.563	0.000	0.708
Self-enhancement	achievement 1	1 (fixed)				0.647
	achievement 2	1.234	0.099	12.412	0.000	0.798
Openness to change	hedonism 1	1 (fixed)				0.647
	hedonism 2	0.795	0.057	13.889	0.000	0.515
	self-direction 1	0.739	0.057	12.997	0.000	0.478
Conservation	security 1	1 (fixed)				0.587
	security 2	0.976	0.049	20.039	0.000	0.573
	tradition 1	1.171	0.054	21.575	0.000	0.688
	tradition 2	0.870	0.052	16.807	0.000	0.511

COVARIANCES

Latent variable 1	Latent variable 2	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Self-transcendence	Self-enhancement	0.125	0.017	7.546	0.000	0.335
	Openness to change	0.270	0.020	13.594	0.000	0.722
	Conservation	0.326	0.021	15.291	0.000	0.962
Self-enhancement	Openness to change	0.268	0.024	11.231	0.000	0.640
	Conservation	0.183	0.019	9.574	0.000	0.482
Openness to change	Conservation	0.269	0.019	13.842	0.000	0.708

Following the CFA of fundamental values, the analysis proceeded with a CFA of the three governance-related values identified in the EFA earlier. Not least due to the lower number of indicators available, this is much more straightforward. Model fit statistics, including model χ^2 significance are all within the range of what is considered good fit (see Table 4.11). Thus there is no need to exclude any items at this stage.

Table 4.11: CFA governance-related values; see appendix C.4 for the lavaan code and full summary.

N (used)	χ^2	df (degrees of freedom)	P-value (χ^2)	CFI	TLI	RMSEA	90% conf. int. (RMSEA)	SRMR
1055	6.480	6	0.372	0.999	0.997	0.009	0.000, 0.042	0.032

LATENT VARIABLES						
Latent variable	**Item/indicator**	**Estimate**	**Std. err.**	**z-value**	**P(>|z|)**	**Std. est.**
Democratic	democratic legitimacy	1 (fixed)				0.561
governance	social justice	1.263	0.202	6.242	0.000	0.709
Economic	economic efficiency	1 (fixed)				0.584
governance	rule of law/order	0.891	0.135	6.590	0.000	0.520
Scientific	sustainability	1 (fixed)				0.475
governance	evidence-based policy-m.	1.260	0.338	3.725	0.000	0.598

COVARIANCES						
Latent variable 1	**Latent variable 2**	**Estimate**	**Std. err.**	**z-value**	**P(>|z|)**	**Std. est.**
Democratic	Economic governance	0.244	0.039	6.226	0.000	0.744
governance	Scientific governance	0.123	0.033	3.741	0.000	0.463
Economic gov.	Scientific governance	0.165	0.044	3.739	0.000	0.596

Similarly the CFA of the three assigned values indicates no need to modify this specific part of the measurement model (see Table 4.12). Considering the low number of six degrees of freedom in both CFAs, it is in fact remarkable that RMSEA values are so close to 0, given that Kenny et al. (2015) found that they are often falsely inflated in models with low numbers of degrees of freedom, even with large sample sizes.

Table 4.12: CFA assigned values; see appendix C.5 for the lavaan code and full summary.

N (used)	**χ^2**	**df (degrees of freedom)**	**P-value (χ^2)**	**CFI**	**TLI**	**RMSEA**	**90% conf. int. (RMSEA)**	**SRMR**
1057	4.245	6	0.644	1.000	1.006	0.000	0.000, 0.033	0.026

LATENT VARIABLES						
Latent variable	**Item/indicator**	**Estimate**	**Std. err.**	**z-value**	**P(>|z|)**	**Std. est.**
Cultural water	traditional lifestyles	1 (fixed)				0.664
values	traditional festivities	0.986	0.106	9.261	0.000	0.654
Economic water	agriculture	1 (fixed)				0.749
values	hydroelectric power	0.615	0.120	5.143	0.000	0.461
Ecological water	Pantanal's nature	1 (fixed)				0.850
values	wildlife	0.770	0.140	5.481	0.000	0.654

COVARIANCES						
Latent variable 1	**Latent variable 2**	**Estimate**	**Std. err.**	**z-value**	**P(>|z|)**	**Std. est.**
Cultural water	Economic w. values	0.282	0.034	8.225	0.000	0.568
values	Ecological w. values	0.297	0.042	7.105	0.000	0.526
Economic w. val.	Ecological w. values	0.148	0.043	3.435	0.001	0.232

4.4.4 Support and opposition to the construction of the Paraguay-Paraná Waterway

Overall, 64.4% of respondents were opposed to the waterway and 33.6% were in favour (while 0.3% refused to answer and 1.7% didn't know), which is in itself an interesting result with clear policy implications. To ascertain that this result is not driven by a potential implicit bias among interviewers or the description of the project, respondents were also asked, beforehand, whether they already knew about the project (64.8% didn't, 35.2% did). Among those respondents who stated to know about the project, 60.1% opposed it and 39.9% favoured it, which is close to the overall ratio of approval. Assuming that those respondents who knew about the project had already formed an opinion, this suggests that no obvious bias was induced through interviewers or the information provided.

4.5 Designing a structural equation model of value landscapes and their effect on public preferences in water governance

After validating measurement models in the preceding sections, the focus here is now placed on designing a structural model. Objectives are two-fold. The first objective is to understand which values are related with support or opposition to the waterway, and the second objective is to understand how values are related among each other and whether the collected data indicates the existence of two distinct value landscapes with a hierarchical structure as theoretically proposed earlier. This contributes to the overall goal of measuring the impact of people's value landscapes on their preferences in water governance. Following best-practice guidelines the modelling trajectory is reported given that merely presenting one 'final model' is a common criticism of applied SEM studies (Garson 2015; Kline 2011). See Figure 4.2 below for the initial model, purely based on theoretical considerations.

In proposing this model one should clarify that opposition to the Paraguay-Paraná Waterway is interpreted as a pro-environmental attitude, whereas support is interpreted not as a pro-environmental attitude, but rather a pro-economic

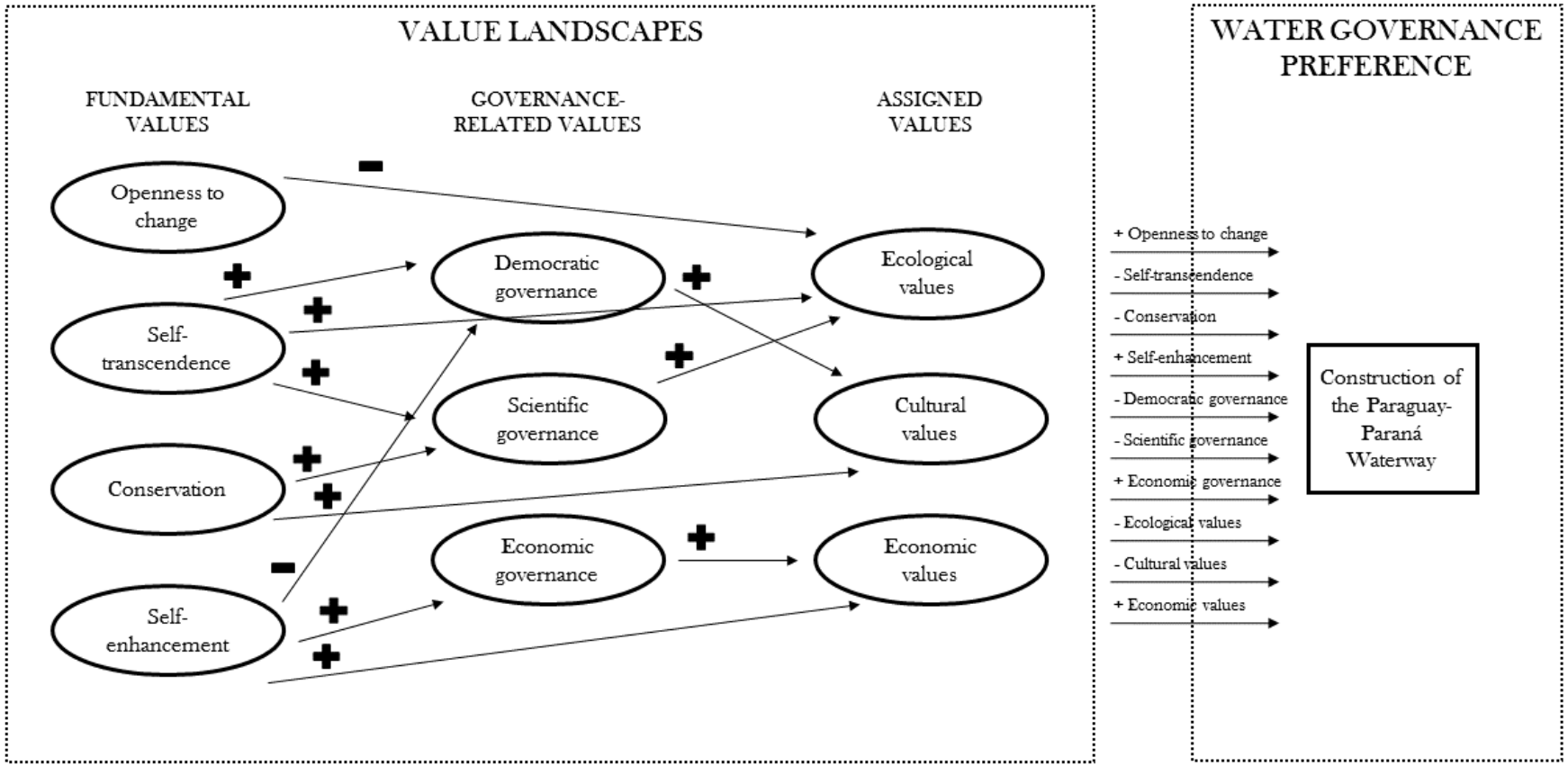

Figure 4.2: Initial structural model; A '+' indicates a hypothesised positive relationship, a '-' a hypothesised negative relationship; for clarity, paths from individual values to the Paraguay-Paraná Waterway box have not been drawn across the entire figure, but are instead represented through the straight horizontal lines to the right.

(development) attitude. This reasoning should hold true for the vast majority of respondents. However, as a caveat it needs to be pointed out that at least one respondent made the exact opposite claim. In his opinion supporting the waterway was the more environmentally friendly policy, since it was going to reduce road traffic, which he found more harmful to the environment than river traffic. Here, however, this potential trade-off is not taken into account and the reasoning instead follows Hamilton's (1999), Gottgens et al.'s (2001), and Pains da Silva et al.'s (2004) interpretation of the waterway as a potential risk for the Pantanal ecosystem, which should still be the dominant view and had also been expressed by the stakeholders as outlined in the previous chapter. The environmental concerns had also been incorporated into the brief description of the controversy around the waterway that was used in the survey (see appendix B.2).

The paths specified from fundamental values to the Paraguay-Paraná Waterway are based on findings from previous studies that tried to link fundamental values and pro-environmental behaviour, preferences and attitudes. According to Steg et al. (2014), who in turn cite nine different studies for this claim, self-transcendence is typically linked with pro-environmental attitudes; hence the negative link to the waterway and the positive link to ecological values. They also suggest that hedonism, which is here incorporated into the dimension of 'openness to change',[30] and self-enhancement are negatively linked with pro-environmental attitudes, thus the negative links to ecological values and the positive links to the waterway. Steg et al. (2014) do not make any statements on conservation, and other studies were mostly inconclusive on the impact of conservation values on environmental attitudes (see e.g. Schultz et al. 2005). However, it is hypothesised here that it should behave similarly to self-transcendence, i.e. more conservative respondents may prefer keeping the status

[30] According to Schwartz (1992), hedonism can be both part of the openness to change dimension or of the self-enhancement dimension.

quo (without a waterway; protecting the Pantanal ecosystem and traditions). This also seems plausible given the close links between self-transcendence and conservation that were found in the CFA earlier.

Hypotheses on the links between assigned values and the waterway should be straightforward: Those who value water in ecological and cultural terms should be opposed to it, and those who value it more in terms of its economic value, should be supportive, also considering the findings of the exploratory study. The links between governance-related values and the waterway are somewhat more speculative due to the lack of previous research on governance-related values. Yet, it is hypothesised that economic governance should be positively linked, due to the emphasis on economic aspects and the interpretation of supporting the waterway as a 'pro-economic' attitude. Democratic governance should be negatively linked, as the population and minorities generally do not favour the waterway (see Table 4.4 for an overview of items constituting the governance-related values), again in accordance with the previous findings from the qualitative study. Scientific governance is also negatively linked as sustainability is often seen as a pro-environmental concept, and current research (i.e. evidence) also tends to be mostly opposed to the waterway (e.g. Junk & Nunes da Cunha 2012; Wantzen et al. 2008). Yet of the three governance-related values, this should still be the most ambiguous construct as sustainability and evidence-based policy-making could also be interpreted or repurposed as 'pro-economic development' (for an example see Pires & da Silva 2009).

Finally, the interrelationships between fundamental values and governance-related values, as well as cultural values are not based on previous research, but reflect novel hypotheses developed within the PhD project. Democratic governance and scientific governance should be positively linked with self-transcendence as those governance-related values emphasise respecting other people's opinions and needs. Conservation was linked to scientific governance

and cultural water values, because both can be related to keeping traditions and conserving them for future generations (although admittedly the link between scientific governance and conservation is less straightforward than the previous links between self-transcendence and democratic/scientific governance). Finally, self-enhancement is expected to be positively linked to economic governance and economic values in line with previous research that found self-enhancement to be negatively related with postmaterialist values (Wilson 2005). Such values are in turn more likely to favour non-economic dimensions (Western & Tranter 2001). Self-enhancement is also expected to be negatively linked to democratic governance because of democratic governance's emphasis on caring about other people's needs.

Running this model in R indicated close to acceptable model fit, with CFI and TLI only marginally below 0.95 (see Table 4.13). Also, more than half of the paths from the various values towards the preference regarding the waterway reflect previous theoretical expectations, with the exception of the paths from conservation, economic governance, ecological values and cultural values. However, it needs to be pointed out that results are not statistically significant, which means that at this point one cannot be sure whether they are the result of chance or not.[31] The path from conservation may have been affected by a measurement issue (see next paragraph below Table 4.13). The paths from ecological and cultural values are safe to be disregarded here since they have the lowest significance levels (0.521 and 0.701), so nothing can be concluded regarding previous expectations based on these figures. However, 'economic governance' is significant at the 10% level with a coefficient of -0.236. Although the p-value is marginally higher than the arbitrary threshold of 0.05 typically used, this suggests that people who care about economic efficiency and rule of law (the

[31] In fact even with a very high significance level one can never be sure, see Ioannidis (2005) for a sobering analysis.

constituting elements of economic governance here) may hence be more likely to oppose the Paraguay-Paraná Waterway.

Table 4.13: Initial full structural equation model of value landscapes and their effect on preferences in water governance; see appendix C.6 for the lavaan code and full summary.

N (used)	χ^2	df (degrees of freedom)	P-value (χ^2)	CFI	TLI	RMSEA	90% conf. int. (RMSEA)	SRMR
1025	1078.042	296	0.000	0.944	0.934	0.051	0.048, 0.054	0.071

LATENT VARIABLES

Latent variable	Item/indicator	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Self-transcendence	universalism 1	1 (fixed)				0.566
	universalism 2	0.990	0.063	15.763	0.000	0.560
	universalism 3	1.276	0.068	18.654	0.000	0.722
	benevolence 1	1.222	0.070	17.441	0.000	0.692
	benevolence 2	1.209	0.069	17.507	0.000	0.684
Self-enhancement	achievement 1	1 (fixed)				0.615
	achievement 2	1.187	0.096	12.383	0.000	0.730
Openness to change	hedonism 1	1 (fixed)				0.638
	hedonism 2	0.841	0.063	13.453	0.000	0.537
	self-direction 1	0.754	0.061	12.399	0.000	0.481
Conservation	security 1	1 (fixed)				0.572
	security 2	0.993	0.052	19.132	0.000	0.569
	tradition 1	1.201	0.058	20.753	0.000	0.687
	tradition 2	0.895	0.056	15.977	0.000	0.512
Democratic governance	democratic legitimacy	1 (fixed)				0.602
	social justice	1.063	0.131	8.143	0.000	0.640
Economic governance	economic efficiency	1 (fixed)				0.633
	rule of law/order	0.767	0.170	4.499	0.000	0.485
Scientific governance	sustainability	1 (fixed)				0.477
	evidence-based policy	0.901	0.149	6.053	0.000	0.430
Cultural water values	traditional lifestyles	1 (fixed)				0.658
	traditional festivities	1.011	0.113	8.957	0.000	0.665
Economic water values	agriculture	1 (fixed)				0.550
	hydroelectric power	1.159	0.328	3.531	0.000	0.637
Ecological water values	Pantanal's nature	1 (fixed)				0.719
	wildlife	1.085	0.134	8.111	0.000	0.780

REGRESSION PATHS

Dependent var.	Independent variable	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Democratic governance	Self-transcendence	0.193	0.067	2.883	0.004	0.181
	Self-enhancement	0.365	0.068	5.399	0.000	0.373
Economic gov.	Self-enhancement	0.443	0.096	4.625	0.000	0.430
Scientific governance	Self-transcendence	-15.325	12.790	-1.198	0.231	-18.186
	Conservation	15.422	12.664	1.218	0.223	18.507
Ecological water values	Self-transcendence	0.224	0.175	1.275	0.202	0.176
	Openness to change	-0.148	0.166	-0.896	0.370	-0.132
	Scientific governance	1.187	0.206	5.764	0.000	0.788
Economic water values	Self-enhancement	0.056	0.086	0.644	0.519	0.062
	Economic governance	0.403	0.161	2.500	0.012	0.464
Cultural water values	Conservation	-4.899	1.765	-2.775	0.006	-4.259
	Democratic gov.	0.773	0.134	5.787	0.000	0.707
	Self-transcendence	4.776	1.792	2.666	0.008	4.106

Paraguay-Paraná Waterway preference	Self-transcendence	-2.270	1.388	-1.636	0.102	-1.285
	Self-enhancement	0.242	0.289	0.839	0.401	0.149
	Conservation	2.107	1.324	1.591	0.112	1.206
	Openness to change	0.232	0.278	0.832	0.405	0.148
	Democratic gov.	-0.391	0.344	-1.137	0.255	-0.236
	Economic governance	-0.406	0.226	-1.794	0.073	-0.257
	Scientific governance	-0.602	0.697	-0.864	0.387	-0.287
	Cultural water values	0.247	0.385	0.641	0.521	0.163
	Economic water values	0.259	0.180	1.436	0.151	0.142
	Ecological water values	0.152	0.397	0.383	0.701	0.109

COVARIANCES

Latent variable 1	Latent variable 2	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Self-transcendence	Self-enhancement	0.145	0.017	8.726	0.000	0.416
	Openness to change	0.256	0.019	13.173	0.000	0.709
	Conservation	0.325	0.022	14.779	0.000	1.004
Self-enhancement	Openness to change	0.257	0.023	11.298	0.000	0.654
	Conservation	0.151	0.016	9.274	0.000	0.428
Openness to ch.	Conservation	0.259	0.019	13.920	0.000	0.709

There are some issues with individual links in the model, most notably those involving parallel paths from both self-transcendence and conservation (e.g. to scientific governance, with out-of-range values for standardised covariances such as 18.507 and -18.186). Such out-of-range values are often caused by exceptionally high correlations between latent variables (Lei & Wu 2007). Thus conservation values were eliminated from the structural equation model. Beyond the methodological issues that its inclusion would cause, there are also substantive reasons for doing so – as noted earlier, in the previous literature, the links between conservation and environmental attitudes were among the weakest and least replicable (Schultz et al. 2005), whereas linking environmental attitudes with self-transcendence consistently does produce significant relationships (Steg et al. 2014), so the initial decision to keep this dimension in the model was reversed. Reducing the number of latent variables also contributes to the overall goal of creating a more parsimonious model, and the importance of doing so should not be underestimated as more complex models are more difficult to interpret and reproduce in subsequent studies. And finally it seems appropriate to exclude conservation not least because in the initial model self-transcendence and

conservation were very strongly correlated, thus not much information is lost by excluding one of a pair of highly similar constructs.

In trying to create a more parsimonious model, a decision was taken to eliminate the governance-related values of 'scientific governance' in the subsequent model. As noted earlier, this seems to be the most ambiguous governance-related value category and excluding it should result in the least significant loss of information. As for now, placing the focus on the more polarising values of democratic governance and economic governance is preferred, also considering the fact that this study is entering a new field of research with no previous experiences to rely on. Furthermore, the fundamental value dimension of openness to change was excluded as a separate construct, because already in the original theoretical model only two outgoing paths had been specified.[32] However, the two items measuring hedonism were added to the two items measuring achievement to jointly form the dimension of self-enhancement. This is in line with Schwartz' own theoretical framework which specifies that hedonism may fall into either dimension, openness to change or self-enhancement (Schwartz & Boehnke 2004). Adding degrees of freedom this way, model parsimony was improved (Mulaik 2001), while at the same time minimising information loss through in fact excluding only one item/indicator from that fundamental value dimension (self-direction 1).

Finally, covariances between the error terms of the governance-related values, and assigned values respectively, were introduced. This is typically done where a researcher suspects a source of joint variance beyond the influence of the specified structural paths. For example, this joint variance might be the result of applying the same measurement method or of sampling the same data in a panel approach over multiple points of time (Garson 2015; Schreiber et al. 2006). The practice is not without controversy, especially where researchers specify

[32] It was originally included to test the hypothesis that those more open to change are more likely to support the construction of the waterway, which was considered to be a plausible assumption.

covariances between indicators based on modification indexes, where it amounts to capitalising on chance (Landis et al. 2009).

However, in this case, not error terms of indicators are correlated, but of the latent endogenous variables themselves, and there are appropriate methodological and conceptual reasons to do so. In fact, Preacher and Hayes (2008) suggest that not correlating error terms of mediating variables (in this case governance-related values and assigned values) might be more problematic than correlating them as it requires strong theoretical assumptions as well, and could easily turn into a source of model misspecification. Some joint variance between the two governance-related values is expected, and the three assigned values, firstly, because of the method used to elicit them, i.e. asking respondents to compare their most important value item with the remaining items. Secondly, joint variance should occur because of the different types of constructs that these values represent, i.e. simply because 'democratic governance' and 'economic governance' are both about governance, rather than fundamental or assigned values, they should share some variance; equivalent reasoning applies to all the other pairs of latent variables within one category of values, such as 'cultural water values' and 'economic water values' for example.[33]

The thus updated full structural equation model indicates better model fit (see Table 4.14/Figure 4.3), with all indexes falling into the range of good model fit, except again sample-size sensitive model χ^2. Also, no out-of-range values in factor loadings, regressions or covariances occurred, indicating that there are no measurement artefacts which could skew the analysis of the model. All factor loadings are at least 0.45 or higher, indicating that the measurement model is acceptable.[34] Regarding regression paths, links between the different types of values are almost all significant: There is a positive link between self-

[33] This was also evident from the EFA mentioned in footnote 24 earlier, in which governance-related values on the one hand and assigned values on the other hand turned out to be two separate latent variables.
[34] This having been ascertained through the modifications made during CFA earlier (section 4.4.3).

transcendence and democratic governance values (1) and especially ecological values (2), between self-enhancement and economic governance values (3), between economic governance and economic water values (4), and between democratic governance and cultural water values (5). All of these paths are in accordance with previous theoretical expectations. The only exception is the path from self-enhancement to democratic governance which had been expected to be negative (and which turned out not to be statistically significant) and the path from self-enhancement to economic water values, which is negative and not statistically significant, contrary to previous expectations. The lack of significance in the latter path may be explained due to the mediating impact of the simultaneous paths from self-enhancement to economic governance and from economic governance to economic water values, which 'capture' the relationship between these constructs, not leaving any common variation to the direct path from self-enhancement to economic water values.

Table 4.14: Final full structural equation model of value landscapes and their effect on preferences in water governance; see appendix C.7 for the lavaan code and full summary.

N (used)	χ^2	df (degrees of freedom)	P-value (χ^2)	CFI	TLI	RMSEA	90% conf. int. (RMSEA)	SRMR
1028	411.706	152	0.000	0.962	0.953	0.041	0.036, 0.046	0.058

LATENT VARIABLES

Latent variable	Item/indicator	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Self-transcendence	universalism 1	1 (fixed)				0.568
	universalism 2	0.967	0.068	14.222	0.000	0.549
	universalism 3	1.285	0.075	17.055	0.000	0.730
	benevolence 1	1.260	0.076	16.480	0.000	0.715
	benevolence 2	1.231	0.073	16.755	0.000	0.699
Self-enhancement	achievement 1	1 (fixed)				0.553
	achievement 2	1.168	0.076	15.317	0.000	0.646
	hedonism 1	1.177	0.080	14.761	0.000	0.651
	hedonism 2	1.021	0.071	14.350	0.000	0.564
Democratic governance	democratic legitimacy	1 (fixed)				0.609
	social justice	1.208	0.131	9.199	0.000	0.736
Economic governance	economic efficiency	1 (fixed)				0.565
	rule of law/order	0.826	0.128	6.422	0.000	0.467
Cultural water values	traditional lifestyles	1 (fixed)				0.664
	traditional festivities	0.995	0.097	10.277	0.000	0.661
Economic water values	agriculture	1 (fixed)				0.645
	hydroelectric power	0.843	0.128	6.567	0.000	0.544
Ecological water values	Pantanal's nature	1 (fixed)				0.767
	wildlife	0.959	0.124	7.746	0.000	0.736

REGRESSION PATHS

Dependent var.	Independent variable	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Democratic	Self-transcendence	0.232	0.072	3.225	0.001	0.217
governance	Self-enhancement	0.145	0.074	1.950	0.051	0.131
Economic gov.	Self-enhancement	0.201	0.081	2.464	0.014	0.196
Ecological w. values	Self-transcendence	0.549	0.086	6.382	0.000	0.406
Economic water	Self-enhancement	-0.090	0.081	-1.107	0.268	-0.077
values	Economic governance	0.662	0.127	5.210	0.000	0.580
Cultural w. values	Democratic gov.	0.574	0.087	6.631	0.000	0.527
Paraguay-Paraná	Self-transcendence	-0.062	0.188	-0.332	0.740	-0.035
Waterway	Self-enhancement	0.296	0.145	2.041	0.041	0.164
preference	Democratic gov.	0.151	0.451	0.333	0.739	0.092
	Economic governance	-0.756	0.552	-1.370	0.171	-0.428
	Cultural water values	0.097	0.317	0.305	0.760	0.064
	Economic w. values	0.384	0.299	1.285	0.199	0.248
	Ecological w. values	-0.375	0.191	-1.961	0.050	-0.287

COVARIANCE

Latent variable 1	Latent variable 2	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Self-transcendence	Self-enhancement	0.166	0.016	10.644	0.000	0.530

RESIDUAL COVARIANCES

Latent variable 1	Latent variable 2	Estimate	Std. err.	z-value	P(>|z|)	Std. est.
Democratic gov.	Economic governance	0.244	0.035	7.064	0.000	0.760
Cultural w. values	Economic w. values	0.163	0.031	5.232	0.000	0.545
	Ecological w. values	0.248	0.038	6.549	0.000	0.626
Economic w. values	Ecological w. values	0.098	0.037	2.665	0.008	0.263

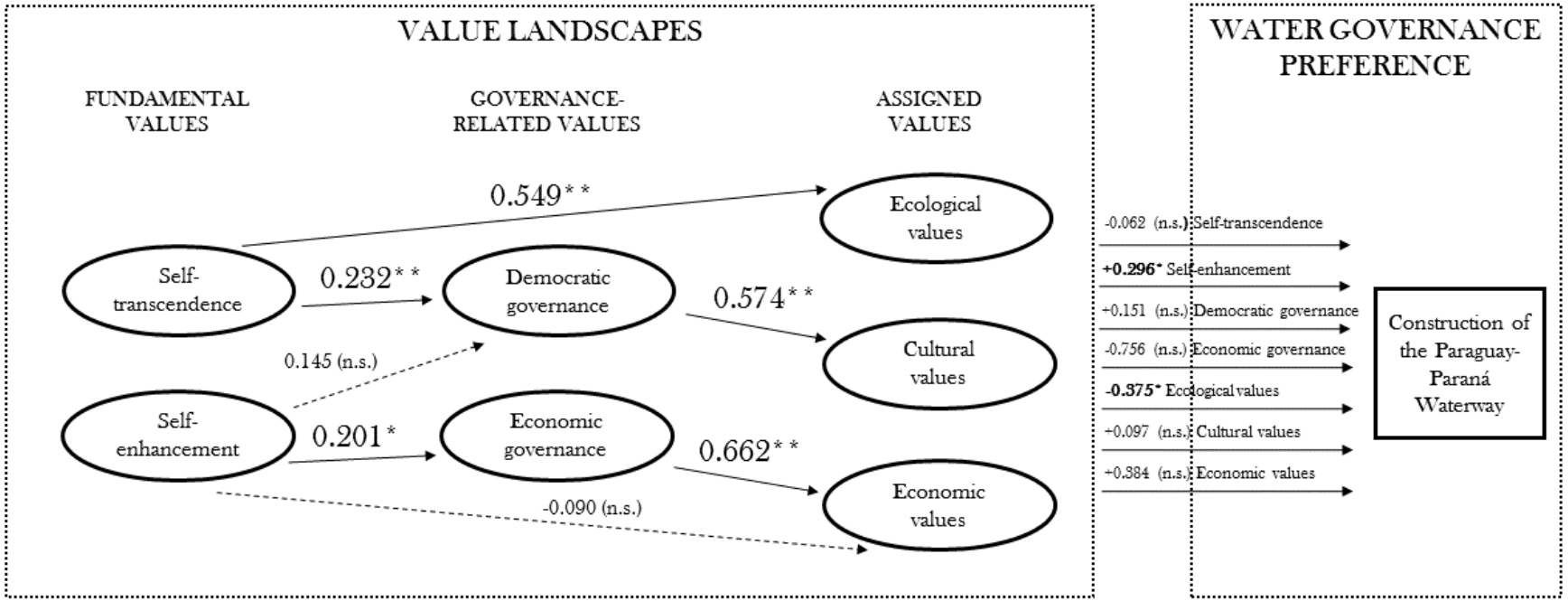

*Figure 4.3: Final structural model; dashed paths indicate non-statistically significant relations; * indicates significance at 0.05 level, ** indicates significance at 0.01 level.*

Summing up to here, empirical evidence can thus be found that different types of values at different levels of abstraction are related to each other, which we may interpret as the existence of two different value landscapes. One consists of the values of self-transcendence, democratic governance-related values, ecological and cultural values, and the other consists of the values of self-enhancement, economic governance-related values, and economic water values.

Looking at regression paths involving preferences on the Paraguay-Paraná Waterway, two of them are found to be statistically significant, namely from self-enhancement which is positively linked, and from ecological water values, which is negatively linked, thus both confirming theoretical expectations. If the three clearly non-significant paths to the waterway preferences (self-transcendence, democratic governance and cultural water values) are deleted to reduce some 'noise' in the data, the results indicate that valuing economic governance is indeed negatively and now significantly associated with supporting the construction of the waterway, contrary to initial expectations (see Table 4.15).

Table 4.15: Alternative regression paths to the 'Paraguay-Paraná Waterway preference'

REGRESSION PATHS						
Dependent var.	**Independent variable**	**Estimate**	**Std. err.**	**z-value**	**P(>|z|)**	**Std. est.**
Paraguay-Paraná	Self-enhancement	0.193	0.106	1.817	0.069	0.106
Waterway	Economic governance	-0.264	0.114	-2.327	0.020	-0.161
preference	Economic w. values	0.101	0.087	1.153	0.249	0.073
	Ecological w. values	-0.310	0.090	-3.458	0.001	-0.236

The (residual) covariances found in the modified model are interesting and are all statistically significant as well. Democratic and economic governance values are quite highly correlated, which is probably owed not only to the fact that the same measurement method was used to elicit them, but also to the fact that both measure 'good governance' to some extent, even if the strategy to reach good governance is different (thus confirming expectations as discussed above). Similarly, self-enhancement and self-transcendence show a correlation of 0.530 which may illustrate the fact that both are general guiding principles in life and

are measured by the same method, which could explain why they share variance. Interestingly, the correlation between ecological and economic water values is rather low at 0.263, providing some empirical evidence that the stereotypical conflict between valuing the economy and valuing the environment is present and relevant in the mind of the public. For the case of Brazil, several authors trace this dichotomy back to the era of the Brazilian military dictatorship (e.g. Nascimento & Griffith 2012; Zhouri 2010), and it had also been identified in the previous qualitative study. At the same time, the correlation between ecological and cultural values is highest, thus supporting the hypothesis put forth in the previous chapter which connected both types of values. The rather high correlation between cultural and economic values, in turn, has not been found there, but could possibly be explained as one of the economic value items made reference to agriculture as an important economic value of water, which (in its traditional form) could be linked to the culture of Mato Grosso.

Summing up, most of the findings regarding the structure and relationships of values are in line with previous research and theoretical expectations, despite potential measurement issues and practical challenges, while links with preferences for the construction of the Paraguay-Paraná Waterway are weaker than expected. Nevertheless, significant links from self-enhancement (positive) and ecological water values (negative) were found, which could be interpreted as 'representative' for their respective value landscape. The individual negative link from economic governance to support for the waterway, in turn, is an interesting finding that runs counter to expectations developed within this thesis, although it should be interpreted cautiously as it does not meet conventional cut-off criteria for statistical significance.

To conclude the description and discussion of this final model, it should be noted that error variances are generally quite high,[35] which could indicate further

[35] See appendix C.7 for individual values of error variances.

measurement issues. While SEM (as opposed to traditional regression models) does mitigate the impact of measurement error to some extent, this is still undesirable, yet can plausibly be explained by the practical difficulties inherent to any research done in this setting and the emerging nature of the research. However, measurement error is more likely to be associated with Type I errors (incorrectly rejecting true null hypotheses) than Type II errors (incorrectly accepting false hypotheses) (Brunner & Austin 2009), so significant relationships identified here are more likely to be valid.

4.6 Discussion

The quantitative study presented in this chapter had two overarching objectives: it is a first attempt at empirically measuring value landscapes *and* identifying their impact on preferences in water governance. Regarding the first issue, the results of the SEM analysis indicate that indeed one can find two opposing value landscapes among members of the general public in the Upper Paraguay River Basin, consisting of self-transcendence fundamental values, democratic governance-related values, cultural and ecological water values on the one hand, and self-enhancement fundamental values, economic governance-related values, and economic water values on the other hand. Paths from the most abstract values to the most concrete assigned values with high coefficients and statistical significance levels could be identified within these two groups of values, which broadly confirms the findings of the previous exploratory study. Furthermore, the direct links e.g. between self-transcendence and ecological water values, as well as the indirect links between self-enhancement and economic water values that were identified run counter to Seymour et al.'s (2010) findings who suggest that fundamental values are not good predictors of assigned values. This may be related to the choice of research method, as both Seymour et al. (2010) and the qualitative study in chapter 3 of this PhD reported difficulties in identifying such

links using semi-structured interviews. This suggests that a quantitative survey approach like the one applied here might be more appropriate.

The use of structural equation modelling was helpful to represent the hypothesised hierarchical structure of values that the conceptual framework of chapter 2 suggests. In the more economically oriented value landscape a mediating effect was found as links between self-enhancement and economic governance, and economic governance and economic water values respectively were both statistically significant with considerable coefficients, but not the direct link between self-enhancement and economic water values. This suggests that not always are the more abstract values directly related to the most concrete values. Given that we do find a strong effect from self-transcendence values on ecological water values, however, one should remain cautious in generalising statements on the hierarchical nature of the structure and interrelationships between values. Certainly one cannot venture the conclusion that causal structures have been identified, which is a common misunderstanding of the method.

The study identified two consistent clusters of values or value landscapes. The contrast between the environment and the economy which is a recurrent theme in environmental research (Nascimento & Griffith 2012; Zhouri 2010) and has sometimes been rejected as too narrow and simplistic (Ioris 2013) evidently still plays a major role in the way the public thinks about water governance and major infrastructure projects. The persistence and intractable nature of many conflicts between 'the environment' and 'the economy' (or alternatively between conservation and development / between ecological assigned values and economic assigned values) may be explained by the rootedness of these assigned values in the more abstract values of self-transcendence and self-enhancement respectively. In fact, if environment vs. economy conflicts are conceptualised as rooted in deeper psychological phenomena such as fundamental values, this may explain to some extent why attempts at overcoming this divide (e.g. monetary

valuation of the environment; 'green growth') are so often unsuccessful or why many people feel uncomfortable about them (see e.g. Bina 2013; Harvey 1996; Kallis et al. 2013; Schulz & Bailey 2014).

Besides the general contribution to research on value landscapes the study also expanded knowledge on governance-related values by offering an exploratory factor analysis of various governance-related value items (see Table 4.6), which suggests that members of the public do have consistent ideas about the nature and processes in which natural resources should be governed. Some people care more about democratic elements such as respecting majority opinions and protecting the rights of minorities, whereas others care more about avoiding the waste of public funds and respect for the law. A more ambiguous third category concerned sustainability, i.e. caring about future generations, and expert input or evidence-based policy-making. The results presented here should be seen as a potential starting point for further future research on public views on governance, which is an often overlooked field of research (Glenk & Fischer 2010).

While the structure of fundamental values has been empirically investigated in thousands of studies, little is known about the structure of governance-related values. The EFA conducted in section 4.4.1 indicated which governance-related values may be related or neighbouring, but it is unclear whether as a whole they might form a circular structure as is the case for fundamental values. Occasionally, it is claimed that democratic governance is more efficient than autocratic governance (Adam et al. 2011), but such studies tell us little about the ways in which members of the public perceive and relate governance-related values. Such judgements implicitly also indicate a hierarchy or preference for efficiency over democratic legitimacy. The research presented here could also be developed further by looking at the example of justice research, which has long made the distinction between distributive and procedural justice (Tyler 1994). Similarly, a typology of governance-related values could distinguish between more process-

based values (e.g. democratic legitimacy) and more content- or outcome-focused governance-related values (e.g. social justice). Parallels with moral philosophy may become evident, especially with the distinction between deontological ethics, which gives priority to moral actions and processes, and consequentialism, which gives a higher weight to results and outcomes (Davidson 2013). Such an expansion of the initial research would certainly require a larger set of survey items than applied here, however, and an empirically defined typology would probably also take a different shape, as the combination of democratic legitimacy and social justice into one common latent variable in the previous EFA indicates already.

Linking value landscapes with preferences in water governance, the second overarching goal, was less straightforward. Within the first value landscape, only ecological assigned values were negatively linked with support for the construction of the Paraguay-Paraná Waterway at an acceptable level of statistical significance. Within the second value landscape, only self-enhancement was positively linked with support for the waterway. Nevertheless, these two paths were in line with theoretical expectations, thus validating them at least partially. To some extent the research confirms previous research in environmental psychology which had identified positive links between environmental attitudes and self-transcendence (and negative links with self-enhancement) (Schultz et al. 2005), which in this case were represented by preferences regarding the construction of the waterway.

A further path from economic governance was tentatively identified which contrary to expectations was negatively linked with support for the waterway. This resonates with individual comments made by some respondents who compared the waterway with the project of constructing a light railway system in Cuiabá. It was originally scheduled for inauguration in 2014 to carry visitors during the FIFA Football World Cup, but resulted in excessive spending of public funds without ever having been completed (Crabb 2016). For this path, potentially some

intermediating variables, such as 'trust in government' may have been relevant as well (see also Glenk & Fischer 2010). Furthermore, it potentially corroborates findings from research on public preferences for large infrastructure projects by Galilea and Medda (2010). They suggested that perceptions of corruption have a significant negative link with the success of transport public-private partnerships, although Galilea and Medda's (2010) focus, research question and research approach were quite different to those employed here (for example, they used country-level data).

The main limitations of the study relate to the measurement of several types of values and of preferences regarding the waterway, which to some extent were owed to the practical realities of applying an extensive survey questionnaire to members of the public at their homes. Possibly some relationships were not uncovered, especially between values and water governance preferences due to these measurement issues, although at the same time, the large sample size has probably had a mitigating impact. Many guidelines in structural equation modelling and quantitative research more generally have been developed in the context of psychometrics and studies with highly cooperative students of psychology (Schultz et al. 2005; Schwartz 1992), which often prove impractical in applied research, e.g. when a 58-item survey is recommended to measure fundamental values (Schwartz & Littrell 2009). In the trade-off between following such guidelines and achieving statistical representativeness in the sample, a greater emphasis was placed on the latter, not least to be able to put policy implications of the research on a firm empirical basis.

The results do have clear policy implications, even if one merely considers percentages of support and opposition to the waterway given that a considerable majority of the population opposes its construction. This should reflect not only a concern for the environment and ecological values of water, but also a worry that the project may result in a waste of public funds and illegal activities, which

would not be unprecedented in Mato Grosso and Brazil more generally (Armijo & Rhodes 2017; Crabb 2016; Joly 2017). This worry can be interpreted as giving importance to the governance-related values of economic efficiency and rule of law/order, which formed a joint latent variable in the present study. Their negative link with support for the waterway can be interpreted as further empirical evidence for this assumption, beyond anecdotal remarks of some respondents.

Constructing the Paraguay-Paraná Waterway across the Pantanal wetland would run counter to public preferences and the state government's plans indicate issues with political legitimacy of the project. One may also assume that political and economic elites of the state might hold different values than the general population although this can be inferred only indirectly and it would certainly be very difficult to conduct a quantitative study of the elite's values. At the same time, no evidence was found that the public is indifferent towards environmental conservation or lacks environmental awareness, which was a common complaint among the stakeholders of Mato Grosso's water sector interviewed during the previous fieldwork stage, at least not in their majority, although social desirability effects may to some extent have played a role in the survey analysed here.

The study appears to strengthen the case of political ecologists and critical scholars who claim that water governance in Brazil is driven by elites and ignores preferences of the public and weaker stakeholder groups (Ioris 2009, 2010; Martins 2015). For the case of Mato Grosso specifically, it is also evident that the specific values of the agribusiness elite that materialised (for example) in the plans to build a waterway through the Pantanal are shared only by a minority of the population, although it remains to be seen whether those plans will eventually be put into practice. Some survey respondents specifically commented that they opposed the waterway because of lacking wider benefits for the general population and the lack of social justice more generally.

4.7 Conclusion

This study reports the first quantitative test of the conceptual framework outlined in the second chapter of this PhD thesis. The results serve as empirical support of the theoretical links between different types of values described there, as well as of the hypotheses regarding the specific case of the Paraguay-Paraná Waterway that were suggested by the exploratory research presented in chapter 3. They can be summarised as three key findings that relate to the three hypotheses specified earlier (see section 4.2): Meaningful relationships among the three types of values specified in the conceptual framework (fundamental values, governance-related values, and assigned values) were identified that reflect their hierarchical structure, with fundamental values being the most abstract construct 'predicting' both governance-related values and assigned values (1). Furthermore, measurable impacts of people's value landscapes were found on their preferences in water governance, although these were weaker than internal links within value landscapes (2).

With regard to the specific case study, two value landscapes were identified among survey respondents in a representative sample of members of the general public in the Upper Paraguay River Basin, which related either positively or negatively with the likelihood to support the construction of the Paraguay-Paraná Waterway (3): one composed of self-transcendence values, democratic governance-related values, ecological and cultural assigned values of water; and the other composed of self-enhancement values, economic governance-related values, and economic assigned values of water. Each value landscape had one statistically significant link with preferences regarding the construction of the waterway, with those adhering to the first value landscape being more likely to oppose it and those adhering to the second value landscape being more likely to support it. Other values that were included in the initial theoretical model did not produce conclusive findings, such as openness to change and conservation values, meaning that they may be more useful in different research contexts.

These findings are an important contribution to several fields of research, including environmental psychology and political ecology, with clear policy implications as public preferences do not match with the plans of the state government of Mato Grosso to build the waterway through the Pantanal. Not least does the research also represent the first large-sample study on public preferences in water governance in Brazil, and is one of a small number of studies that take a quantitative approach towards governance-related values and values in water governance, which is quite uncommon (Glenk & Fischer 2010; Seymour et al. 2011). Future research could, for example, investigate the structure of governance-related values and identify how these are related in the mind of the public. Further ideas and reflections are presented in the following chapter 5.

Chapter 5:
Conclusions and Further Debates

This final chapter summarises the main findings and lines of discussion covered in this PhD thesis and additionally, offers some further reflections beyond. Section 5.1 serves as an introduction to this chapter and revisits some selected lessons learnt during the various stages of the PhD project. Sections 5.2 to 5.4 provide some open-ended additional reflections beyond the original aims of the thesis, outlining further potential contributions of this research to academia, as well as paths for future investigation. Specifically, section 5.2 explores the meaning of the term 'value' as measurement, explains how it is related to the philosophical debate on value pluralism, and discusses the contribution of the research performed in this PhD project to that debate. Section 5.3 comments on the context for water governance in Mato Grosso and Brazil, how it may have affected the data collected for this PhD, especially during the severe political and economic crisis in 2016, and what these experiences might mean for the study of governance-related values in different political contexts more generally. Section 5.4 explores how the specific hydrological and geographical context of the Upper Paraguay River Basin and Mato Grosso, which are characterised by natural water abundance, played into stakeholders' perceptions of water values and water governance in the area, and what this could tell us about the impacts and political implications of water abundance in general. Finally, section 5.5 provides the overall conclusions for the PhD.

5.1 Some lessons learnt

On a conceptual level, the review of the various disciplinary perspectives on values in chapter 2 has shown that despite their diversity, it is in principle possible to distinguish two main conceptualisations of the term. First, values may be

understood as guiding principles or abstract objectives that people seek to uphold in decision-making situations. Second, values may be understood as a quality or measure of importance assigned to external objects, such as water resources. A novel conceptual framework was developed specifically in relation to the link between values and water governance, which suggests that water governance is shaped by (and shapes) values on various levels of abstraction, from abstract fundamental values to governance-related values to the more concrete assigned or water values. As the qualitative research in chapter 3 has shown, in practice, people do not usually consciously reflect on the most abstract personal guiding principles in decision-making, even if these may in fact inform or determine a certain preference or decision; nevertheless, it is possible to elicit information on the principles that they would like to see reflected in governance processes. The intermediary position of such governance-related values with regards to their abstractness between fundamental values and assigned values is thus also reflected in the level of awareness and conscious engagement that stakeholders and professionals displayed. Assigned values of water, such as for fishing or biodiversity were most readily stated since they directly related to the work of the interviewed stakeholders; however, where interviewees did comment beyond their immediate area of expertise, two main lines of thought, or value landscapes emerged in the case study used here.

Value landscapes can be defined as groups of values that are closely linked in a person or group's mental space as shown in both the qualitative and quantitative results of this PhD. These value landscapes then display similar relations with certain elements of water governance, i.e. policies, politics, or the institutions (polities) in which politics takes place and policies are formulated. In the case study here, the main focus was placed on a policy, the plans of the state government of Mato Grosso to build a waterway through the Pantanal wetland, although some attitudes towards institutions such as river basin committees became evident as well, and stakeholders also commented on the distribution of

power (i.e. politics) in the state. The waterway itself is mostly of interest to the state's agribusiness sector, but has been criticised for its potential impacts on the Pantanal's ecosystem, including its fish stocks, by concerned ecologists, activists, and members of local communities in the Pantanal.

The two value landscapes that emerged out of the qualitative research were composed of 1) economic water values such as its value for agriculture, navigation, tourism and aquaculture, complemented with governance-related values such as economic efficiency, order and 'development', and 2) non-economic water values such as cultural, aesthetic and ecological water values, as well as the governance-related values of conservation, tradition, social justice and solidarity. The first value landscape coincided with support for the waterway, the second was linked to opposition. Remarkably, support and opposition coincided quite clearly with certain value landscapes, giving some weight to the claim that this novel form of interpreting conflicts in water governance may have empirical relevance. As a side note, the concept of sustainability was universally popular, but in conjunction with very different interpretations of its meaning, supporting the position of scholars who claim that universal calls for certain governance-related values should best be avoided (Ingram 2011).

The existence of such opposing value landscapes could also be statistically corroborated in a large survey with members of the general public in the Upper Paraguay River Basin (chapter 4), supporting the theoretical and conceptual propositions made in the earlier chapters. Using structural equation modelling, it could be shown that indeed some values were closely linked with each other, namely self-transcendence values, democratic governance-related values, and cultural and ecological assigned values of water on the one hand, and self-enhancement values, economic governance-related values, and economic assigned values of water on the other hand. Moreover, each of these value landscapes had one statistically significant link with a preference in water

governance: self-enhancement was positively related with support for the construction of the waterway, and ecological water values were negatively related. This is a very interesting result in so far as it potentially allows interpreting conventional environment vs. development conflicts, such as the one around the Paraguay-Paraná Waterway, as expressions of deeper conflicts between fundamental values such as self-transcendence vs. self-enhancement values. Empirical measurement via quantitative survey instruments unavoidably goes along with a simplification of concepts. Here, for example, democratic legitimacy was measured with a statement on majority rule, but while this is one key element of democratic legitimacy, other strategies are conceivable, such as the introduction of checks and balances into the political system or free deliberation as Bekkers and Edwards (2007) point out.

The PhD thus makes academic contributions at the conceptual level with the introduction and proposal of the concept of value landscapes, and emphasising especially the importance of governance-related values as one type of values commonly overlooked in research on values in water governance; and at the empirical level, which served to show the proposed conceptual framework's relevance for the analysis of conflicts in water governance, as well as to identify the existence of value landscapes among water-related stakeholder groups and members of the general public.

Both the qualitative and the quantitative work also have clear policy implications. The polarisation among the interviewed stakeholders, rooted in contrasting value landscapes that may explain the longevity of the conflict over the construction of the Paraguay-Paraná Waterway make for a pessimistic outlook when it comes to identifying a potential compromise that would satisfy both supporters and opponents. These findings are potentially of relevance to conflicts in other areas of Brazil, too, especially the Amazon region where waterways are being built in conjunction with large dams to facilitate exports from the ever-shifting

agribusiness frontier (Fearnside 2015; Fearnside & Figueiredo 2015; Killeen 2007). Moreover, the institutional framework that is supposed to serve as a forum for deliberation and comprise, i.e. river basin committees reuniting water stakeholders within the river basin, is still very incipient, and attitudes towards such forums differ as well. Members of the agribusiness sector commented that they did not believe that river basin committees were in the position to produce meaningful outcomes due to the inefficiency of debate and the lack of pragmatism of other stakeholders. On the other hand, local actors in the Pantanal displayed more willingness to engage with public institutions, citing that solidarity among members of e.g. environmental councils was important to support each other's causes and achieve the best possible outcome for everyone in the area. Yet, without sufficient funds to implement any potential decisions, little progress or development in any direction should be expected with regard to meaningful engagement between different stakeholders.

According to the results of the quantitative study, the majority of the general public in the Upper Paraguay River Basin seems to be opposed to building the stretch of the Paraguay-Paraná Waterway that would cross the Pantanal, whereas government policy clearly indicates that it is planning to do so (Arévalo 2015), even if works may currently be on hold due to the severe political and economic crisis that has befallen Brazil. This disconnect between public preferences and actual water governance may thus also indicate a crisis of values and political legitimacy, as values of the public and values implicit in government policy do not overlap.

5.2 Water values beyond measurement?

A significant share of the debate in interdisciplinary and social science environmental research concerns the question whether monetary valuation of the environment is acceptable or not. This debate can be taken into many different

value-related directions – for example, whether and when monetary valuation violates moral values (Söderholm & Sundqvist 2003); whether it takes anthropocentrism too far and whether intrinsic values of the environment can be respected while applying it (Davidson 2013); whether the identified monetary figures are substantively meaningful (Hausmann 2012) and whether they actually have an impact on policy (Rogers et al. 2015). While in the preceding chapters monetary valuation techniques were evidently not applied to capture the water values of the Upper Paraguay River Basin, one key criticism of monetary valuation merits being repeated here, with relevance to the PhD research conducted.

Ecological economists originally split from environmental economists because they rejected the assumption that different values can be compared using one measurement unit, usually money (Martinez-Alier et al. 1998). From a philosophical perspective, the different types of values that can be attributed to the environment were supposed to be incommensurable; one value is not like another. Not everything could be meaningfully translated back into 'social welfare'. However, while some ecological economists have warned about the so-called 'tragedy of well-intended valuation' and ensuing commodification through PES schemes etc. (Gómez-Baggethun & Ruiz-Pérez 2011), the key philosophical criticism does not concern the use of *money* as a measurement rod; it is the failure to account for the incommensurability and substantively diverging nature of different types of values that is the issue.

The logical consequence of the incommensurability of values is abandoning quantitative measurement that encompasses more than one type of value. And indeed, a significant sub-field of the environmental valuation literature recommends and deals with deliberative valuation, which aims to avoid commensurability between different types of values (see e.g. Kenyon et al. 2001; O'Neill & Spash 2000). Elsewhere, 'compensability' in the form of multi-criteria

analyses has been proposed as an alternative to commensurability, allowing for trade-offs between 'weakly comparable' values that arise in real-life decision-making (Martinez-Alier et al. 1998). However, it is not very evident in how far this solves the original problem with incommensurability and monetary valuation, beyond the fact that those advocating multi-criteria analyses and compensability are aware of the philosophical issues of comparing values in one measurement unit. Similarly, some critics may argue that using survey instruments that compare various (water) values for the purpose of structural equation modelling, e.g. on 5-point Likert scales as was done in this thesis, is equally problematic, since it forces respondents to rate various ontologically different values on a standardised scale. It almost appears as if there were intrinsic limits to the study of values that originate in the very nature of the concept, and that would make it impossible to actually measure them.

What seems to be the key here, is to clarify our understanding of the term 'value', within the group of values that were broadly classified as 'values as measurements' (as opposed to 'values as guiding principles') in various passages within this PhD. It is argued here that within this group of values one can distinguish two further types of values – measures of importance on the one hand, and qualitative values, on the other hand, that may arguably come closer to the core of what values *really* are. For the case of the PhD, measures of importance would be the individual ratings that survey respondents assigned to various (water) values. These can be quantified and they represent the value that a person attributes to water resources, for example. Clearly, some respondents value water differently than others, e.g. giving more weight to economic values or ecological values respectively, and this is reflected in the quantitative measures. Qualitative values had to be represented in a simplified form as survey items, e.g. making reference to the importance of water for the survival of wildlife in the Upper Paraguay River Basin. But of course, one could capture this qualitative value better in a longer and much more detailed description of the exact processes that relate water with wildlife in the area, which

one could argue come closer to exploring the *real* ecological value of water. At the same time, only with great difficulty could one compare such a description with a description of the technical processes that are at work when water in the river basin is used to produce hydroelectric energy – this difficulty representing the core tenet of value pluralism, i.e. values are different from each other, and we cannot compare them.

The obvious alternative to comparing dense descriptions of certain values (which we may call a qualitative form of measuring values) is to compare quantitative measures of their respective importance, as was done in the SEM study in the previous chapter. This way, we are not compromising the fundamental assumption of value pluralism, that values cannot be converted into each other using a common unit, since we are comparing (or converting) only their quantitative aspects, i.e. their measures of importance. The qualitative aspects of values are spared from inappropriate comparisons. By using this strategy, value pluralism, which was defined as one of the characteristics of the novel conceptual framework proposed in chapter 2 (see p. 49), remains compatible with the research carried out in this PhD thesis.

The ability to use quantitative methods evidently hinges on the recognition that values as measurements are composed of qualitative and quantitative aspects, and their usefulness for the study of values has been demonstrated in the SEM study. Especially when it comes to studying *interlinkages* between values, quantitative methods have their place. While one could compare two descriptions of water values and verify whether they share some content (e.g. the presence of healthy fish stocks in the Pantanal, which is relevant for ecological, cultural, and economic values), one would be tempted to ask: *How often is this aspect (healthy fish stocks) mentioned in the various descriptions?* or *How many people have mentioned healthy fish stocks?* Using quantitative methods, we can give definite answers to

such questions, and quantify the level of interlinkage between various water values.

A practical recommendation resulting from this, is that in studying values, we should not limit ourselves to one form of measurement. Evidently, we cannot formulate hypotheses on interlinkages between values without some previous qualitative exploration. But also from the applied perspective of a practitioner in water governance (which researchers performing monetary valuation usually use to justify their work), it is often necessary to estimate the relative importance of certain values to take the right (or at least an informed) decision. Providing this in purely qualitative terms would be impractical, for example when one wants to act in response to the will of 'the public' (which by no coincidence is very often given in the form of bar charts or pie charts). Similarly, from a postpositivist epistemological perspective, theoretical hypotheses about linkages between values (or other variables) cannot be accepted without empirical proof and evidence. Yet by their very nature, testing them often requires a quantitative approach.

The case for combining qualitative and quantitative research methods has been made before (Tashakkori & Teddlie 1998), and for the field of water values, should have been strengthened by the discussion in this section. In fact, while quantitative research always requires some previous qualitative exploration, quantitative results also open up novel research questions that can be addressed with qualitative methods. For the example of the PhD, one could perform a focus group study to explore what reasoning accounts for the combination of certain survey items into one common latent variable, e.g. the items measuring a preference for economic efficiency and for rule of law/order, which were subsumed here under the (imperfectly named) latent variable 'economic governance-related values'. If such research pointed to further categories of governance-related values that made theoretical sense to focus group participants,

it could be followed up by a further exploratory, then confirmatory factor analysis, and so on, this way completing circles in which quantitative and qualitative research methods take turns, which serve the ultimate goal of ever more closely understanding the phenomenon at hand.

5.3 The context of governance and governance-related values

Ingram (2011) has offered a powerful defence of taking into account contexts in water governance. According to her, the global water governance sector, with its history of endorsing various changing concepts and paradigms such as Integrated Water Resource Management (IWRM) (or nowadays nexus-thinking) as 'the solution' for water management issues around the globe is especially prone to producing unhelpful universal 'panaceas'. The same applies to governance-related values: in a context of economic uncertainty 'more transparency' may not necessarily mitigate the problems that governance faces. Her analysis points to the importance of closer investigating the context of water governance in a given case study area.

Water governance in the Upper Paraguay River Basin is embedded in the wider context of public administration in Brazil on the one hand, and the specifics of the water sector in Mato Grosso on the other hand (see also section 5.4). As has been briefly mentioned at various points in this PhD, public administration and governance in Brazil are currently experiencing a deep crisis. Widespread corruption among the country's elites has been revealed through the so-called 'Operation Car Wash', a judicial investigation into bribes paid in the context of awarding public contracts to the country's major companies. Between April 2014 and December 2015 alone the investigation resulted in the arrests of 116 people and the conviction of 61 of them, including Marcelo Odebrecht, whose family owns one of Latin America's largest conglomerates, and André Esteves, the

chairman of BTG-Pactual, Latin America's largest investment bank (Melo 2016: 60).

In the context of an economic recession and the ever-expanding multi-billion dollar corruption scandal, public approval ratings of the then newly re-elected (i.e. October 2014) president Dilma Rousseff fell to single-digit figures in November 2015, the lowest for any president since the return to democracy in Brazil in the 1980s (Melo 2016). This situation culminated in a highly politicised impeachment process in which the Brazilian Federal Senate voted for her removal from office in August 2016 (Winter 2017).[36] Ironically, Eduardo Cunha, who had authorised a vote on the impeachment process in the Brazilian Chamber of Deputies in his function as its speaker, was implicated in the corruption scandal himself, and is currently serving a 15 year prison sentence for accepting bribes in relation to business dealings of the semi-public oil company Petrobras in Benin, among other reasons (Bergamo et al. 2017). Also, more than half of the members of a parliamentary impeachment commission were facing corruption charges themselves, while 303 of the 513 members of the Chamber of Deputies, and 49 of the 81 members of the Federal Senate were being investigated for serious crimes (Bevins 2016). Furthermore, compromising evidence against Rousseff's main opponent in the 2014 election, Aécio Neves, as well as her former vice-president and current president Michel Temer has come to light in May 2017, following revelations from a plea bargain of brothers and businessmen Wesley and Joesley Batista from JBS S.A., the largest meat-processing company in the world (Mattoso 2017).[37]

[36] While Dilma Rousseff was formally charged of breaking federal budget regulations, independent of the Operation Car Wash investigation, her impeachment is better explained in terms of political power struggles during a time of deep economic and political crisis (see Santos & Guarnieri 2016 for an overview, and Avelar 2017 for a critical response, highlighting the politicised nature of interpreting the events even within the academic sector).

[37] At the time of writing, several entities had requested the opening of an impeachment process against Michel Temer, including the influential Order of Attorneys of Brazil (Vettorazzo 2017).

While Brazil has suffered deep political crises resulting from corruption scandals before, (see e.g. Weyland 1998), the sheer scale of the scandal, which involved all major political parties and the country's business elites, and the severity of the crisis represents an unprecedented downfall, considering that as recently as March 2013 Dilma Rousseff had still enjoyed approval rates of 60% (Santos & Guarnieri 2016), and Brazil was widely seen as an emerging global power, both economically and politically, during the presidency of her predecessor, Luiz Inácio 'Lula' da Silva (Hurrell 2008). The situation in Mato Grosso has been equally crisis-ridden, with former governor Silval Barbosa being imprisoned in 2015 as part of the 'Operation Sodom' due to corruption and money laundering charges over R$2.6 million (about £600,000) (Rodrigues 2016), and a track record of expensive unfinished infrastructure projects, including a light railway system in Cuiabá that was supposed to transport visitors during the 2014 FIFA football world cup (Crabb 2016).

While Operation Car Wash was already under way during the first fieldwork stage with stakeholders from water-related sectors, the second fieldwork stage with members of the general public took place in the midst of Dilma Rousseff's impeachment process (shortly after the Chamber of Deputies' vote to remove her from office, but before her impeachment by the Federal Senate). It seems quite likely that the context of what has been called "the biggest corruption scandal in history" (Watts 2017) should have influenced people's responses, especially regarding governance-related values, to some extent.[38] Ingram's (2011) analysis, quoted above, relates to the selection of appropriate guiding principles (i.e. governance-related values) for a given context, but it does not necessarily tell us how the wishes of the public might be affected by certain governance contexts, such as the political scandal described here.

[38] Section C3 of the quantitative survey intended to measure public (dis-)satisfaction with governance, which is still to be analysed as a topic beyond the PhD project (see appendix B).

Nevertheless, one could assume that people would have attributed higher weight as usual to the governance-related values of rule of law/order and economic efficiency (which had formed a joined latent factor in the exploratory factor analysis, see Table 4.6 in chapter 4), given the catastrophic record of the respective federal and state governments at the time on these principles. Other governance-related values, such as sustainability or social justice, while certainly affected by 'bad governance', too, might not have been related as directly to the corruption scandal.

The discussion of context for the measurement of governance-related values opens up several questions for further investigation. Firstly, if we accept the fact that the political and economic context has been able to affect the results of the quantitative study, the obvious question would be: *how much?* What is the baseline from which they moved? In what direction did they move? Would they have been equally affected during the first decade of the millennium, when the economic outlook was largely positive? Can we, in fact, assume that a certain baseline exists? Overall, these questions amount to an inquiry into the nature of governance-related values in the mind of the public more generally, i.e. whether they are similar to fundamental values, which are largely stable and related to each other in a permanent pattern (the circular structure proposed by Schwartz 1992 and Schwartz et al. 2012), only with varying levels of prioritisation between individuals. A single study can of course not answer these questions, pointing to the need of repeated data collection, ideally at regular intervals with large samples, to be able to capture fluctuations in governance-related values. In line with theoretical remarks made in chapter 2, one would expect governance-related values to be stable and universal, but not as stable and universal as fundamental values, not least because fundamental values are among the earliest values that children adopt from their parents (Hitlin & Piliavin 2004), while the same might not necessarily be said about abstract principles such as sustainability or evidence-based policy-making.

Secondly, research on governance-related values should be seen in the tradition of research on the relationship between authorities, the state, and citizens more generally, which not least in Brazil has a long history (see e.g. de Carvalho 2001; Holston 2009; Mitchell & Wood 1999; Wittman 2009). The way people understand the concept of citizenship should be strongly affected by their preferences for certain governance-related values, and vice versa. De Carvalho's (2001), work, for example, points to the dominance of the value of social justice above other values, given Brazil's history and present of extreme social inequality. Furthermore, he notes that personal freedom and active citizenship are generally awarded less priority than e.g. in the US, given that certain social benefits have been acquired under politically repressive governments in Brazil, although his outlook on the future is cautiously optimistic. Wittman's (2009) research in turn, suggests that collective (i.e. governance-related) values were transformed by activist organisations, such as the influential Landless Rural Workers Movement (MST) especially in rural areas, favouring participation, solidarity, and social justice. Yet Holston (2009) finds that democratization in Brazil has activated an increased public interest in order, rule of law, and security, predominantly in urban areas, given the perceived impunity with which criminal gangs were able to operate in the period following military rule.

All these individual case studies from the 'citizenship literature' investigate to some extent the effect of context on governance-related values in Brazil – eliciting an overall quantitative picture would thus be a worthwhile objective, to be able to make more conclusive statements on the structure and development of governance-related values in Brazil. Given that the cited studies originate from very different contexts (e.g. agrarian reform; urban crime), investigating whether people's preferences for governance-related values vary according to the specific field of interest (especially water governance), would also be of interest, despite the challenges resulting from the fact that members of the public typically have quite broad opinions about governance in general, not least judging from the

fieldwork experience within this PhD. However, the previous research on the concept of citizenship and state-society relations certainly legitimates the general idea of studying governance-related values with members of the general public (as opposed to only focussing on professional actors in governance), and offers multiple entry points for future research and engagement.

5.4 Water values, water abundance, and environmental awareness

Brazil is often cited as the country with the largest renewable freshwater supply in the world (Sprague 2007) and within Brazil, Mato Grosso is one of the states with the greatest natural water abundance, which additionally has its share in three of the country's major river basins, the Amazon River Basin to the north, the Araguaia-Tocantins River Basin to the northeast, and of course the Plata Basin (of which the Upper Paraguay River Basin is a part) to the south. These specific geographical and hydrological characteristics were a recurring theme in the stakeholder interviews analysed in chapter 3. While water abundance per se is neither a type of value nor an element of water governance, it does act as a relevant context factor that may influence both. The perceptions and political implications of water abundance are worth discussing here, as another topic for reflection and potential further investigation beyond the PhD.

First of all, it should be self-evident that this water abundance sustains the rich water values described in the qualitative study, including economic, ecological, and cultural values. For example, two interviewees commented:

> *"Water is fundamental, we need a lot, from the production of fruit to fishing, which is very common here, and tourism which is growing a lot. I can't tell you it is irrelevant – it is extremely relevant. It is one of the factors that contributed quite a lot to the diversity that Mato Grosso has. Here we have a little bit of everything. We have the touristic aspect, we have the agricultural part, and we have the part of the forest,*

too, [it is] *very broad."*

(Representative of an agribusiness association) – quote 35

"There is a use of the Cuiabá River beyond environmental questions [...]. *The population has an intense relationship with the use, with the water of the Cuiabá River, because culturally, mainly the riparian population has the river as its reference point, its identity.* [...] *There are the festivals of the saints, which all have the river as their reference points,* [...] *so there is the cultural question, the dances, everything that happens among those that live in the riparian areas."*

(University professor and researcher) – quote 36

Such statements do not only reflect well the contrast between economic and non-economic water values described in chapter 3; they were also representative of a larger number of quotes which discuss the fundamental importance of water abundance in the region. This had led some to call Mato Grosso the 'State of the Water(s)' (with the Upper Paraguay River Basin as one key component, not least because the state capital Cuiabá is located there), including in marketing material for the state government (de Arruda-Filho 2013). From this perspective, water abundance is thus seen as a universally positive feature of the region, and connects well with the historical imaginary of the state as a place that has always been known for its natural resource abundance (Castro et al. 2002; Siqueira 2002).

However, critical scholars have remarked that water abundance does not necessarily always go along with an absence of conflict and on occasion may even exacerbate conflicts (Alatout 2009; Selby & Hoffmann 2014). Similarly, some more critical water stakeholders interviewed for this PhD thesis commented on the perceived negative consequences of water abundance, especially its impact on environmental awareness, and the quality of water governance:

"Here in Mato Grosso, there is a difficulty, that the people, even when we began our work here, about saving water, the people, friends who came to our house, they complained, they criticised us saying: 'Gosh, you are crazy! Doing a project like this, saving water, with all the water that we have here in the Cuiabá River.' Later I found out that Mato

> *Grosso is a state with excessive water, if you compare it with other regions of Brazil, it is a state considered to be 'the state of the waters'. So, if you want to recycle water in a state with so much water, it is counterintuitive, it is a waste of time, let's call it that way. So at the time, we were criticised because of that, because water was there in abundance."*
>
> (Civil society activist, here commenting on the experiences of developing a domestic water recycling project) – quote 37

> *"The state of Mato Grosso is a state which is densely drained by many rivers, it has a large volume of surface and groundwater. But because here* [in the capital region of Cuiabá] *we have the largest concentration of people, that's why we have* [water] *stress. This stress isn't caused by a lack of water, I told you: it is a lack of investment in the* [supply] *network, new* [water] *abstractions, new systems. Here we are lacking infrastructural works to deliver this water and to treat this water. This is what is missing. We have this privilege, yes,* [but] *that's why* [we have] *this story: 'What are you worried about? We have a lot of water!'"*
>
> (Staff member in the Secretariat for the Environment, Mato Grosso) – quote 38

Following this logic, water abundance is in fact to blame for many shortcomings of water governance in Mato Grosso (see also SEMA 2009), given that it contributes to a state of carelessness, both among members of the general public, and senior politicians. These may confuse raw water availability with availability of treated water for domestic consumption, as in the first of the two quotes above, or they may not give it the political priority that it deserves more generally. For example, some technical staff in the Secretariat for the Environment commented that other environmental problems were regularly given more attention, such as illegal deforestation caused by frequent fires. This is an interesting conceptualisation or discursive strategy, since the failures of water governance are attributed directly to natural geographical features of the area, rather than human mismanagement, and may serve to deflect responsibility for such failures away from the interviewed stakeholders and their organisations. Still, a common message or policy implication that most of the interviewed water professionals

supported (or would likely support) is that more environmental awareness is needed among members of the public, and senior government, to improve water governance and other environmental issues.[39]

It appears that water abundance may thus have contradictory impacts and implications. On the one hand, it is the basis for rich and diverse water values, and on the other hand, it is to blame for poor governance, causing a need for awareness creation. Further uncovering the dynamics and the role of water abundance for water values and water governance would thus be a worthwhile topic of investigation, not least to identify in how far certain claims and conceptualisations of water abundance are employed for political purposes. Furthermore, it would be interesting to conduct similar research on the link between values and water governance (as was done in this PhD thesis) in more water scarce areas of Brazil, to identify whether and if yes, how the context of natural water abundance in the Upper Paraguay River Basin influenced the results of the research presented here.

5.5 Concluding remarks

This PhD thesis set out to study links between values and water governance, from a theoretical and empirical perspective. The research was divided into three separate, yet related stages: First, a conceptual, theory-building stage, second, an exploratory, qualitative, and hypothesis-generating stage, and third, a quantitative and hypothesis-testing stage. The conceptual stage consisted of a systematic review of the conceptualisation of values in economics, philosophy, psychology, human geography, and political ecology, which served as input into the development of a novel conceptual framework. This novel framework was termed the 'value landscapes approach', and it suggested that several types of values, which were

[39] Section E of the survey questionnaire developed for this PhD (see appendix B) aimed at gauging levels of environmental awareness and awareness of water issues among members of the general public and will be analysed in future research for academic and policy purposes.

identified in a systematic review of the values literature, shape (and are shaped by) water governance: fundamental values, governance-related values, and assigned values, which are related to each other in groups of values, metaphorically called value landscapes.

The concept of fundamental values was taken from the environmental and social psychology literature (Fulton et al. 1996; Rokeach 1973; Schwartz 1992, 1996; Schwartz et al. 2012) and stands for abstract guiding principles or transsituational goals which guide individual decision-making, especially in situations of value conflict. These fundamental values are shared, but prioritised differently by humans across cultures and social backgrounds, and can be broadly summarised as falling into the two broad pairs of opposing dimensions of self-transcendence vs. self-enhancement, and openness to change vs. conservation, although alternative conceptualisations of fundamental values exist (e.g. Inglehart 2006).

The concept of governance-related values refers to the idealised characteristics and properties of (water) governance that are deemed desirable by groups and individual stakeholders, as well as members of the general public. While many studies investigate the presence of individual governance-related values, such as sustainability, efficiency, or social justice in various water governance scenarios (e.g. Kuzdas et al. 2014; Lieberherr et al. 2012; Mustafa & Reeder 2009), systematic investigations of multiple governance-related values and their interrelationships are rare (Glenk & Fischer 2010). Similarly, a lot of research is still conducted from a normative, rather than analytical perspective, i.e. investigating or evaluating strategies to fulfil certain values, rather than making inquiries about their origin and empirical preferences for governance-related values among stakeholders and members of the public.

The concept of assigned values was taken from interdisciplinary natural resource governance literature, including environmental and ecological economics, human geography, political ecology, and others (Brown 1984; Jones, Ross, et al. 2016;

Lockwood 1999; Seymour et al. 2010) and refers to the concrete values that humans assign or attribute to natural resources. For the case of water resources, assigned values are also often called 'water values' (Bark et al. 2011; Croitoru et al. 2016; Euzen & Morehouse 2011; Gibbs 2010; Hanemann 2006; Ioris 2012a). Examples are the various uses of water, such as for human consumption, irrigation, navigation, or recreation, and less tangible uses such as cultural and spiritual values, as well as the use of water for the maintenance of ecosystems and the non-human environment.

While the empirical focus of this thesis was placed on the influence of values on water governance, an influence of certain governance contexts on values is to be expected and conceivable, too (see e.g. Falk & Szech 2013). Water governance in turn, was defined as the combination of water policy (the 'content' of decision-making), water politics (the 'power play' between different actors or stakeholders), and water polity (the institutional framework in which policy is developed and politics takes place), following the conceptualisation proposed by Treib et al. (2007). All three types of values can be linked to all three elements of water governance in one way or another.

To test this theoretical assumption and further hypotheses mentioned above empirically, a case study was developed that applied the novel conceptual framework to the conflict around the construction of the Paraguay-Paraná Waterway through the Pantanal wetland in the Upper Paraguay River Basin of Mato Grosso, Brazil. This case study is not only ideal to investigate links between values and water governance, it is also of high practical relevance given that the plans for the waterway are highly controversial and have been the subject of a conflict between various stakeholder groups for several decades. Supporters cite benefits for economic growth and soybean cultivation in the state, Mato Grosso's main economic sector (e.g. Pires & da Silva 2009), while opponents express worries about the hydrological, ecological and social impacts of the project in the

Pantanal, which is recognised as a biodiversity refuge of global importance (e.g. Junk & Nunes da Cunha 2012). The contrast between environment and development is thus captured well in the plans to build the waterway, which would facilitate exports to world markets, especially China.

The qualitative, exploratory, and hypothesis-generating study with stakeholders from water-related sectors in the Upper Paraguay River Basin led to the conclusion and hypothesis that two contrasting value landscapes are related to a tendency to either support or oppose the waterway. One of them consisted of economic water values and governance-related values such as efficiency, order, pragmatism, 'development', and sustainability, while the other consisted of non-economic water values and governance-related values such as equity, solidarity, social justice, tradition, conservation, and sustainability.[40] The first coincided with support, the second with opposition to the waterway. For methodological reasons, fundamental values could not be investigated at this stage of the research project, given that stakeholders would not typically reflect on their fundamental motivations in the format of a semi-structured interview (see also Seymour et al. 2010).

The quantitative, hypothesis-testing study with a representative sample of members of the general public in the Upper Paraguay River Basin (n=1067) sought to measure value landscapes, and empirically test interlinkages between various values and preferences in water governance. Using structural equation modelling (SEM) techniques, it could be demonstrated statistically that indeed, certain values are closely linked as value landscapes in the mental space of survey respondents, including fundamental values. These were, on the one hand, a value landscape consisting of self-transcendence values, democratic governance-related values (social justice and democratic legitimacy), and ecological and cultural water

[40] Sustainability was attributed with utmost importance by almost all interviewed stakeholders, but in conjunction with very different visions of what this might mean in practice.

values. On the other hand, a value landscape consisting of self-enhancement values, economic governance-related values (economic efficiency and rule of law/order), and economic water values could be identified. Both value landscapes had strong statistically significant links among its constituting elements.

Linking values with the water governance preference (support or opposition to the Paraguay-Paraná Waterway) was less straightforward. Nevertheless, valuing ecological water values went along with clear opposition to the waterway, while self-enhancement went along with support for the waterway, which could be shown at acceptable levels of statistical significance. This suggests that each value landscape coincides with a certain preference regarding the waterway, as hypothesised in the previous qualitative exploration. Most notably, the findings may also suggest that classical environment vs. development conflicts between different actors (such as the waterway in this case), may in fact be rooted at the fundamental psychological level of self-transcendence vs. self-enhancement values. This would mean that the findings have relevance far beyond the individual case study, wherever economic motivations and environmental protection clash, and might explain why attempts to overcome this divide are so often unsuccessful or controversial, as e.g. in the case of the green economy and green growth (Bina 2013; Schulz & Bailey 2014) or monetary valuation of the environment (Harvey 1996; Kallis et al. 2013).

Beyond the academic contribution to research on links between values and water governance, the findings of this PhD project have clear policy implications, too, and from a political ecology perspective, can inform us about the political legitimacy of water governance in the Upper Paraguay River Basin. Evidently, a majority of members of the general public interviewed for this PhD were opposed to the construction of the Paraguay-Paraná Waterway, suggesting that the project, currently in the planning phase, lacks democratic legitimacy, possibly due to a wider disconnect between powerful state actors and the population in the area.

Both the qualitative and quantitative research pointed to close relations between certain values and preferences regarding the project, which suggests that those values attached to opposing the waterway are not sufficiently taken into account by the coalition of state and federal government actors, and members of the agribusiness and logistics sectors who are promoting it. Comparing values desired by stakeholders and the public with those values expressed by actual water governance this way, is thus an effective way to assess the political legitimacy of water governance in a given time and location.

Appendix A:

Sampled Census Tracts and the Upper Paraguay River Basin

A.1 Sampled census tracts

Census tract no.	Municipality	Neighbourhood	No. of interviews	Percent (total)
5101258050000006	Araputanga	Centro/Santo Antônio	30	2.8
5101704050000015	Barra do Bugres	União	31	2.9
5102504050000032	Cáceres	Santos Dumont	30	2.8
5102504050000103	Cáceres	Monte Verde	29	2.7
5103007100000006	Chapada dos Guimarães	Various rural areas	21	2.0
5103403054100011	Cuiabá	Porto	31	2.9
5103403054100071	Cuiabá	Alvorada	29	2.7
5103403054100137	Cuiabá	Santa Rosa	21	2.0
5103403054200012	Cuiabá	Baú	18	1.7
5103403054200074	Cuiabá	Poção	22	2.1
5103403104000010	Cuiabá	Morada da Serra	28	2.6
5103403104000067	Cuiabá	Morada da Serra	29	2.7
5103403104200002	Cuiabá	Jardim das Américas	28	2.6
5103403104200064	Cuiabá	Jardim Renascer	28	2.6
5103403104201128	Cuiabá	Alphaville	0	0
5103403104300054	Cuiabá	Tijucal	29	2.7
5103403104301107	Cuiabá	Jardim Industriário	29	2.7
5103403104301162	Cuiabá	Tijucal	29	2.7
5103601050000004	Dom Aquino	Centro	30	2.8
5104807050000015	Jaciara	Santo Antônio	30	2.8
5105200050000015	Juscimeira	Cajus	29	2.7
5105903050000006	Nobres	São José	29	2.7
5106232050000015	Nova Olímpia	Jardim Ouro Verde	25	2.3
5106505050000018	Poconé	Areião/Jurumirim	30	2.8
5107008050000013	Poxoréu	Centro	30	2.8
5107263050000012	Santo Afonso	Various rural areas	25	2.3
5107602050000055	Rondonópolis	Jardim Tropical	30	2.8
5107602050000126	Rondonópolis	Vila Olinda	29	2.7
5107602050000240	Rondonópolis	La Salle-AG 32	20	1.9
5107602050000368	Rondonópolis	Recanto Maria Flávia	12	1.1
5107602300000078	Rondonópolis	Jardim Sumaré	30	2.8
5107800100000003	Santo Antônio do Leverger	Various rural areas	30	2.8
5107958050000045	Tangará da Serra	Vila Goiás/Jardim Acapulco	30	2.8
5107958050000123	Tangará da Serra	Jardim Paraíso	25	2.3
5108402050000039	Várzea Grande	Mapim	27	2.5
5108402050000096	Várzea Grande	Costa Verde	25	2.3

510840205000154	Várzea Grande	Nova Várzea Grande	28	2.6
510840205000217	Várzea Grande	Santa Isabel	30	2.8
510840220000006	Várzea Grande	Construmat	31	2.9
510840220000062	Várzea Grande	Construmat	30	2.8

A.2 List of districts in the Upper Paraguay River Basin

Acorizal - Acorizal – MT; Baús - Acorizal – MT; Aldeia - Acorizal – MT; Alto Paraguai - Alto Paraguai – MT; Capão Verde - Alto Paraguai – MT; Lavouras - Alto Paraguai – MT; Araputanga - Araputanga – MT; Arenápolis - Arenápolis – MT; Barão de Melgaço - Barão de Melgaço – MT; Joselândia - Barão de Melgaço – MT; Barra do Bugres - Barra do Bugres – MT; Assari - Barra do Bugres – MT; Tapirapuã - Barra do Bugres – MT; Cáceres - Cáceres – MT; Bezerro Branco - Cáceres – MT; Caramujo - Cáceres – MT; Horizonte do Oeste - Cáceres – MT; Nova Cáceres - Cáceres – MT; Chapada dos Guimarães - Chapada dos Guimarães – MT; Água Fria - Chapada dos Guimarães – MT; Rio da Casca - Chapada dos Guimarães – MT; Cuiabá - Cuiabá – MT; Coxipó da Ponte - Cuiabá – MT; Coxipó do Ouro - Cuiabá – MT; Guia - Cuiabá – MT; Curvelândia - Curvelândia – MT; Denise - Denise – MT; Dom Aquino - Dom Aquino – MT; Entre Rios - Dom Aquino – MT; Figueirópolis D'Oeste - Figueirópolis D'Oeste – MT; Glória D'Oeste - Glória D'Oeste – MT; Monte Castelo D'Oeste - Glória D'Oeste – MT; Vale Rico - Guiratinga – MT; Indiavaí - Indiavaí – MT; Itiquira - Itiquira – MT; Jaciara - Jaciara – MT; Celma - Jaciara – MT; Jangada - Jangada – MT; Jauru - Jauru – MT; Lucialva - Jauru – MT; Juscimeira - Juscimeira – MT; Irenópolis - Juscimeira – MT; Santa Elvira - Juscimeira – MT; São Lourenço de Fátima - Juscimeira – MT; Lambari D'Oeste - Lambari D'Oeste – MT; Mirassol d'Oeste - Mirassol d'Oeste – MT; Sonho Azul - Mirassol d'Oeste – MT; Nobres - Nobres – MT; Bom Jardim - Nobres – MT; Coqueiral - Nobres – MT; Nortelândia - Nortelândia – MT; Nossa Senhora do Livramento - Nossa Senhora do Livramento – MT; Pirizal - Nossa Senhora do Livramento – MT; Ribeirão dos Cocais - Nossa Senhora do Livramento – MT; Seco - Nossa Senhora do Livramento – MT; Nova Brasilândia - Nova Brasilândia – MT; Riolândia - Nova Brasilândia – MT; Nova Olímpia - Nova Olímpia – MT; Pedra Preta - Pedra Preta – MT; São José do Planalto - Pedra Preta – MT; Poconé - Poconé – MT; Cangas - Poconé – MT; Fazenda de Cima - Poconé – MT; Porto Esperidião - Porto Esperidião – MT; Porto Estrela - Porto Estrela – MT; Poxoréo - Poxoréo – MT; Alto Coité - Poxoréo – MT; Jarudore - Poxoréo – MT; Paraíso do Leste - Poxoréo – MT; São José dos Quatro Marcos - São José dos Quatro Marcos – MT; Santa Fé - São José dos Quatro Marcos – MT; Reserva do Cabaçal - Reserva do Cabaçal – MT; Rio Branco - Rio Branco – MT; Santo Afonso - Santo Afonso – MT; São José do Povo - São José do Povo – MT; Nova Catanduva - São José

do Povo – MT; São Pedro da Cipa - São Pedro da Cipa – MT; Rondonópolis - Rondonópolis – MT; Anhumas - Rondonópolis – MT; Nova Galiléia - Rondonópolis – MT; Boa Vista - Rondonópolis – MT; Vila Operária - Rondonópolis – MT; Rosário Oeste - Rosário Oeste – MT; Arruda - Rosário Oeste – MT; Bauxi - Rosário Oeste – MT; Marzagão - Rosário Oeste – MT; Salto do Céu - Salto do Céu – MT; Cristinópolis - Salto do Céu – MT; Vila Progresso - Salto do Céu – MT; Santo Antônio do Leverger - Santo Antônio do Leverger – MT; Engenho Velho - Santo Antônio do Leverger – MT; Mimoso - Santo Antônio do Leverger – MT; Caité - Santo Antônio do Leverger – MT; Varginha - Santo Antônio do Leverger – MT; Tangará da Serra - Tangará da Serra – MT; Progresso - Tangará da Serra – MT; São Joaquim - Tangará da Serra – MT; São Jorge - Tangará da Serra – MT; Várzea Grande - Várzea Grande – MT; Bom Sucesso - Várzea Grande – MT; Passagem da Conceição - Várzea Grande – MT; Porto Velho - Várzea Grande – MT; Capão Grande - Várzea Grande – MT; Nova Marilândia - Nova Marilândia – MT.

A.3 List of municipalities in the Upper Paraguay River Basin

Acorizal – MT; Alto Paraguai – MT; Araputanga – MT; Arenápolis – MT; Barão de Melgaço – MT; Barra do Bugres – MT; Cáceres – MT; Chapada dos Guimarães – MT; Cuiabá – MT; Curvelândia – MT; Denise – MT; Dom Aquino – MT; Figueirópolis D'Oeste – MT; Glória D'Oeste – MT; Guiratinga – MT; Indiavaí – MT; Itiquira – MT; Jaciara – MT; Jangada – MT; Jauru – MT; Juscimeira – MT; Lambari D'Oeste – MT; Mirassol d'Oeste – MT; Nobres – MT; Nortelândia – MT; Nossa Senhora do Livramento – MT; Nova Brasilândia – MT; Nova Olímpia – MT; Pedra Preta – MT; Poconé – MT; Porto Esperidião – MT; Porto Estrela – MT; Poxoréo – MT; São José dos Quatro Marcos – MT; Reserva do Cabaçal – MT; Rio Branco – MT; Santo Afonso – MT; São José do Povo – MT; São Pedro da Cipa – MT; Rondonópolis – MT; Rosário Oeste – MT; Salto do Céu – MT; Santo Antônio do Leverger – MT; Tangará da Serra – MT; Várzea Grande – MT; Nova Marilândia – MT.

Appendix B:
Survey Questionnaires

B.1 Original questionnaire / B.2 English translation

Entrevistador: _____ Questionário No (por entrevistador): _____
Município: _____ Bairro: _____
Setor Censitário (Número): _____
Data: _____ Hora (Início): _____ Hora (Fim): _____

Bom dia! / Boa tarde! / Boa noite!
Me chamo [...] e sou estudante da UFMT [*mostrar cartão de estudante*].
Estou trabalhando para um projeto de pesquisa sobre a gestão de água em Mato Grosso e seria uma ajuda grande se o Sr./a Sra./você pudesse nos ajudar com isso. A sua participação duraria aproximadamente 30 minutos.

Todas a suas respostas serão confidenciais e anônimas. O que nos interessa são as suas opiniões, então **não vai ter respostas certas ou erradas**. Os resultados da pesquisa serão só usados para fins acadêmicos.
Concordaria em participar em nossa pesquisa?

☐ **NÃO** ⇨ Tudo bem, em qualquer caso muito obrigado pela atenção!

☐ **SIM** ⇨ Muito obrigado!

PARTE A

Para começar, terei algumas perguntas sobre o Sr./a Sra./você. O objetivo principal é saber se as pessoas que entrevistamos representam bem a sociedade de Mato Grosso.

A1 O seu sexo é... *Só perguntar se não for obvio.*

☐ **Masculino** 1 ☐ **Femenino** 2 ☐ **Outros** 3 ☐ *Recusado* 88

A2 Faz quanto tempo que mora em Mato Grosso ou que veio a morar pela primeira vez?

Anos: ☐ ☐ **Toda a vida**

A3 Por favor, poderia me indicar a sua idade?

☐ **18-19** 1 ☐ **20-24** 2 ☐ **25-29** 3 ☐ **30-34** 4 ☐ **35-39** 5 ☐ **40-44** 6 ☐ **45-49** 7
☐ **50-54** 8 ☐ **55-59** 9 ☐ **60-64** 10 ☐ **65-69** 11 ☐ **70-74** 12 ☐ **75 ou mais** 13 ☐ *Recusado* 88

A4 Quantas pessoas moram no seu domicílio?

☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6+**

Um domicílio é um espaço separado (por exemplo por muros e cercas) com um teto que é habitado por pessoas que compartilham todos ou a maioria dos seus gastos e que não precisam de atravessar nenhum outro domicílio para ter acesso ao seu espaço.

A5 Que nível de educação completou?

☐ **Nenhuma / Ensino fundamental incompleto** 1 ☐ **Fundamental completo / Médio incompleto** 2 ☐ **Médio completo / Superior incompleto** 3 ☐ **Superior completo** 4

A6 Atualmente o Sr./a Sra./você trabalha?

A6-a 1 ☐ **SIM** ⇨ *Continuar com A7* 0 ☐ **NÃO** ⇨ *Continuar com A6-b*

A6-b Por que não?

1 ☐ **Aposentado** 2 ☐ **Estudante** 3 ☐ **Outros**

A7 Tem uma profissão relacionada ao uso da água? Qual?

☐ **NÃO** 0 ☐ **Agricultura/pecuaria** 1 ☐ **Pesca** 2 ☐ **Turismo** 3 ☐ **Abastecimento de água** 4

☐ **Pesquisa** 5 ☐ **Administração/regulamento** 6 ☐ **Saneamento** 7 ☐ **Outra:** 8 _____

A8 Poderia me indicar por favor quanto é a **renda mensal do seu domicílio**?
Quer dizer, somando a renda de todas as pessoas em sua casa.

Por favor mostrar as opções de resposta ao entrevistado com o cartão S1.

Se o entrevistado estiver hesitando, por favor explicar que o nível de renda é uma informação muito importante para a pesquisa. Mas também não insistir demais.

1 ☐ **Até um salário mínimo** < R$ 880 / mês

2 ☐ **1-2 salários mínimos** R$ 880 - 1760 / mês

3 ☐ **2-5 salários mínimos** R$ 1761 - 4400 / mês

4 ☐ **5-10 salários mínimos** R$ 4401 - 8800 / mês

5 ☐ **10-20 salários mínimos** R$ 8801 - 17600 / mês

6 ☐ **Mais de 20 salários mínimos** > R$ 17600 / mês

88 ☐ *Recusado* 99 ☐ *Não sabe*

A9 Poderia por favor me dizer o seu número de telefone ou celular? Talvez você receba uma chamada para comprovar a realização desta entrevista. Não vamos passar o seu número para ninguém.

Número: _____ ☐ *Recusado* 88

PARTE B

B1 Agora gostaria de falar dos rios e das águas do Mato Grosso.
Irei mencionar 6 razões por que os rios e águas aqui são importantes, e gostaria que me indique qual destes é a mais importante para o Sr./a Sra./você, **na sua opinião pessoal**:

Por favor mostrar as opções de resposta ao entrevistado com o cartão S2.
Não mencionar opções "recusado" e "não sabe".

1 ☐ Os modos de vida tradicionais, por exemplo a pesca artesanal ou uso de barro para cerâmica, dependem dos rios.

2 ☐ A economia do estado depende da abundância de água, sobretudo a agropecuária.

3 ☐ Os rios sustentam a natureza no Pantanal.

4 ☐ A cultura de Mato Grosso tem uma forte relação com os rios e as águas, por exemplo nas festas tradicionais.

5 ☐ Os rios produzem quase toda a energia elétrica usada em Mato Grosso.

6 ☐ Os rios e as águas são importantes para a sobrevivência da vida selvagem, por exemplo as onças, os pássaros, jacarés etc.

88 ☐ *Recusado* 99 ☐ *Não sabe* ⇨ *Se a resposta for "recusado" ou "não sabe", seguir com parte C (mas tentar evitar isso se for possível!)*

B2 Agora, que o Sr./a Sra./você mencionou que [*reler o tópico escolhido na resposta B1*] é o tópico mais importante. Compare, por favor, com os outros tópicos, qual o nível de importância?

Não repetir a razão que o entrevistado já identificou como mais importante.
Por favor mostrar as opções de resposta ao entrevistado com o cartão S3.
Não mencionar opções "recusado" e "não sabe".

B2-a Os modos de vida tradicionais, por exemplo a pesca artesanal ou uso de barro para cerâmica, dependem dos rios.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-b A economia do estado depende da abundância de água, sobretudo a agropecuária.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-c Os rios sustentam a natureza no Pantanal.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-d A cultura de Mato Grosso tem uma forte relação com os rios e as águas, por exemplo nas festas tradicionais.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-e Os rios produzem quase toda a energia elétrica usada em Mato Grosso.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-f Os rios e as águas são importantes para a sobrevivência da vida selvagem, por exemplo as onças, os pássaros, jacarés etc.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

PARTE C

C1 Agora eu gostaria de conhecer as suas opiniões sobre alguns **princípios que poderiam guiar as autoridades quando eles tomam decisões em respeito à água**.

Me diga, por favor, qual dos seguintes princípios deveria ser **o mais importante** para as autoridades na sua opinião?

Por favor mostrar as opções de resposta ao entrevistado com o cartão S4.
Ler opções duas vezes pausadamente, sobretudo se o entrevistado tiver dificultade ler o cartão S4.
Não mencionar opções "recusado" e "não sabe".

1 ☐ Pensar no impacto para as gerações futuras.

2 ☐ Não desperdiçar dinheiro público.

3 ☐ Seguir à opinião da maioria da população.

4 ☐ Consultar pesquisas e especialistas.

5 ☐ Cuidar dos pobres e minorias.

6 ☐ Assegurar a participação política dos que foram afetados.

7 ☐ Todo mundo segue às leis.

88 ☐ *Recusado* 99 ☐ *Não sabe* ⇨ *Se a resposta for "recusado" ou "não sabe", seguir com parte D (mas tentar evitar isso se for possível!)*

C2 Agora, que o Sr./a Sra./você mencionou que [*reler o tópico escolhido na resposta C1*] é o princípio mais importante. Compare, por favor, com os outros princípios, qual o nível de importância?

Não repetir o princípio que o entrevistado já identificou como mais importante.
Por favor mostrar as opções de resposta ao entrevistado com o cartão S3.
Não mencionar as opções "recusado" ou "não sabe".

C2-a Pensar no impacto para as gerações futuras.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-b Não desperdiçar dinheiro público.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-c Seguir à opinião da maioria da população.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-d Consultar pesquisas e especialistas.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-e Cuidar dos pobres e minorias.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-f Assegurar a participação política dos que foram afetados.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-g Todo mundo segue às leis.

igualmente importante	**quase tão importante**	**pouco menos importante**	**muito menos importante**	**não é importante**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3 Para concluir esta parte, gostaria de saber, o quanto está satisfeito com as autoridades com respeito a estes princípios? Me diga, por favor, o quanto concorda ou discorda com as seguintes frases.

Por favor mostrar as opções de resposta ao entrevistado com o cartão S5.

Não mencionar as opções "recusado" ou "não sabe".

C3-a As autoridades pensam no impacto para as gerações futuras.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-b As autoridades não desperdiçam dinheiro público.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-c As autoridades seguem à opinião da maioria da população.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-d As autoridades consultam pesquisas e especialistas.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-e As autoridades cuidam dos pobres e minorias.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-f As autoridades asseguram a participação política dos que foram afetados.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-g As autoridades seguem às leis.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

PARTE D

D1 As seguintes perguntas não serão sobre a água, mas ajudarão a entender por que as pessoas têm certas opiniões.
Irei descrever pessoas com diferentes características e pedirei que me diga o quanto cada uma dessas pessoas é ou não parecida com o Sr./a Sra./você.

Por favor mostrar as opções de resposta ao entrevistado com o cartão S6.
Não mencionar opções "recusado" e "não sabe".

D1-a Uma pessoa que dá importância a ter novas ideias e ser criativa. Gosta de fazer as coisas à sua maneira.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado* / *Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐ / 99 ☐

D1-b Uma pessoa para quem é importante ser rica. Quer ter muito dinheiro e coisas caras.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado* / *Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐ / 99 ☐

D1-c Uma pessoa que acredita que todas as pessoas no mundo devam ser tratadas igualmente. Acredita que todos devam ter as mesmas oportunidades na vida.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado* / *Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐ / 99 ☐

D1-d Uma pessoa que dá muita importância em poder mostrar as suas capacidades. Quer que as pessoas admirem o que faz.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-e Uma pessoa que dá importância a viver num local onde se sinta segura. Evita tudo o que possa por a sua segurança em risco.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-f Uma pessoa que gosta de surpresas e está sempre à procura de coisas novas para fazer. Acha que é importante fazer muitas coisas diferentes na vida.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-g Uma pessoa que acha que as pessoas devem fazer o que são mandadas. Acha que as pessoas devem cumprir sempre as regras mesmo quando ninguém estiver por perto.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-h Uma pessoa para quem é importante ouvir a opinião de outras pessoas. Mesmo quando discorda de alguém, continua a querer compreender essa pessoa.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-i Uma pessoa para quem é importante ser humilde e modesta. Tenta não chamar a atenção sobre si.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-j Uma pessoa para quem é importante passar bons momentos. Gosta de agradar a si mesmo.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-k Uma pessoa para quem é importante tomar as suas próprias decisões. Gosta de ser livre e não depender dos outros.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-l Uma pessoa para quem é importante ajudar os que a rodeiam. Preocupa-se com o bem-estar dos outros.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-m Uma pessoa para quem é importante ter sucesso. Gosta de receber o reconhecimento dos outros.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-n Uma pessoa para quem é importante que o Governo garanta a sua segurança contra todas as ameaças. Quer que o Estado mantenha a ordem.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-o Uma pessoa que procura aventura e gosta de correr riscos. Quer ter uma vida emocionante.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-p Uma pessoa para quem é importante portar-se sempre como deve ser. Evita fazer coisas que os outros digam que é errado.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-q Uma pessoa para quem é importante poder liderar. Quer que as pessoas façam o que ela diz.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-r Uma pessoa para quem é importante ser leal aos amigos. Dedica-se às pessoas que lhe são próximas.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-s Uma pessoa que acredita seriamente que as pessoas devem proteger a natureza. Proteger o meio ambiente é importante para ela.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-t Uma pessoa que dá importância à tradição. Faz tudo o que pode para agir de acordo com a sua religião e a sua família.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-u Uma pessoa que procura aproveitar todas as oportunidades para se divertir. É importante para ela fazer coisas que lhe dão prazer.

Exatamente como eu	**Muito parecido comigo**	**Parecido comigo**	**Um pouco parecido comigo**	**Não parecido comigo**	**Não tem nada a ver comigo**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

PARTE E

E1 Agora, outro tema: O Sr./a Sra./você sabe de questões relacionadas à água aqui no seu município?

☐ 0 **NÃO** ⇨ *Continuar com pergunta E3*

☐ 1 **SIM** ⇨ *Continuar com pergunta E2*

Recusado 88 ☐ **_Não sabe_** 99 ☐ ⇨ *Pergunta E3*

E2 De quais questões o Sr./a Sra./você se lembra?

Por favor não dar sugestões. Múltiplas respostas possíveis.
Dar tempo para pensar.

Resposta

_____
_____
_____
_____
_____
_____

E3 Aqui tenho uma lista de questões que outras pessoas mencionaram.
Me diga, por favor, em que nível eles afetam **o seu município**?

Por favor mostrar as opções de resposta ao entrevistado com o cartão S6.
Não mencionar opções "recusado" e "não sabe".

E3-a Secas e estiagens:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-b Enchentes e inundações:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-c Contaminação com esgotos e falta de saneamento básico:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-d Contaminação com agrotóxicos e fertilizantes:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-e Contaminação com elementos tóxicos usados no garimpo:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-f Problemas com o abastecimento de água doméstico, por exemplo qualidade baixa ou abastecimento irregular e falta de água:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-g Problemas na administração do abastecimento, por exemplo com a cobrança, atrasos, cobranças indevidas:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-h Problemas na gestão da companhia de água, por exemplo corrupção e falência:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-i Conexões e canos ilegais à rede de abastecimento de água:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-j Mudança do clima, por exemplo chuvas fora do período normal:

Nenhum problema	**Problema menor**	**Problema maior**	**Problema enorme**	*Recusado*	*Não sabe*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-k Destruição do meio ambiente:

Nenhum problema 1 ☐ **Problema menor** 2 ☐ **Problema maior** 3 ☐ **Problema enorme** 4 ☐ *Recusado* 88 ☐ *Não sabe* 99 ☐

E3-l Falta de consciência ambiental:

Nenhum problema 1 ☐ **Problema menor** 2 ☐ **Problema maior** 3 ☐ **Problema enorme** 4 ☐ *Recusado* 88 ☐ *Não sabe* 99 ☐

E3-m Redução do número de peixes:

Nenhum problema 1 ☐ **Problema menor** 2 ☐ **Problema maior** 3 ☐ **Problema enorme** 4 ☐ *Recusado* 88 ☐ *Não sabe* 99 ☐

E3-n Problemas com usinas hidrelétricas:*

Nenhum problema 1 ☐ **Problema menor** 2 ☐ **Problema maior** 3 ☐ **Problema enorme** 4 ☐ *Recusado* 88 ☐ *Não sabe* 99 ☐

**Registrar quais problemas se o entrevistado mencionar*

E3-o *Resposta opcional (quais os problemas com usinas hidréletricas)*

_____
_____
_____
_____

E4 Se envolve ativamente em algumas dessas questões? Isso quer dizer que tenta contribuir para diminuir o problema no trabalho ou como cidadão, por exemplo através de militância, de melhoria nas práticas ou conscientização.

0 ☐ **NÃO** ⇨ *Continuar com parte F* 88 ☐ *Recusado* 99 ☐ *Não sabe*

1 ☐ **SIM** ⇨ *Continuar com pergunta E5* ⇨ *Continuar com parte F*

E5 Quais atividades o Sr./a Sra./você desenvolve em relação ao que foi dito? É em função do seu trabalho ou como cidadão?

Resposta

_____
_____
_____
_____

PARTE F

F1 Agora eu gostaria de conhecer a sua opinião sobre um projeto relacionado à água. Já ouviu falar da proposta de construir uma hidrovia pelo Pantanal, no Rio Paraguai, começando perto de Cáceres?

0 ☐ **NÃO** ⇨ *Continuar com F1-a* 1 ☐ **SIM** ⇨ *Continuar com F2*

F1-a A hidrovia utilizará o rio para o transporte de produtos com navios comerciais.

F2

O objetivo principal da hidrovia é facilitar a exportação de soja, milho e outros produtos, porque é mais barato transportar eles pelo rio em vez de nas rodovias até os portos na costa do Brasil. Uma vez construida a hidrovia, ela trará benefícios para o agronegócio e por isso é provável que a agricultura cresça mais.

Mas também existem preocupações que a hidrovia possa ter um impacto negativo no Pantanal. Cientistas esperam que o número de peixes diminua, que o ambiente natural seja danificado e que seja mais difícil para os pescadores locais e agricultores familiares se sustentarem.

Agora, imagine que o governo fizesse um referendo sobre a hidrovia. **Votaria a favor ou contra** a construção da hidrovia?

Não mencionar opções "recusado" e "não sabe".

1 ☐ **A FAVOR**	⇨ *Depois de F3 seguir com F4*		*Recusado*	*Não sabe*
0 ☐ **CONTRA**	⇨ **!!!** ***Depois de F3 seguir com F5*** **!!!**		88 ☐	99 ☐

F3 ***Todos respondem F3***

Me diga, por favor, o quanto concorda ou discorda com as seguintes frases:

Por favor mostrar as opções de resposta ao entrevistado com o cartão S5.
Não mencionar opções "recusado" e "não sabe".

F3-a Construir a hidrovia será bom para o Mato Grosso a longo prazo.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

F3-b A construção da hidrovia terá impactos negativos para as minorias.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

F3-c O dinheiro público será bem usado na construção da hidrovia.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

F3-d A hidrovia terá efeitos negativos para futuras gerações.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

F3-e A hidrovia ajudará tirar pessoas da pobreza.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

F3-f A construção da hidrovia será um desperdício de dinheiro público.

Concordo totalmente	**Concordo parcialmente**	**Talvez**	**Discordo parcialmente**	**Discordo totalmente**	*Recusado*	*Não sabe*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

F4 ***Seguir <u>aqui</u> se o entrevistado foi <u>a favor</u> da hidrovia.***
Seguir <u>com F5</u> se o entrevistado foi <u>contra</u> a hidrovia!

F4-a **Se o governo tivesse consultado com todos os grupos que estariam afetados**, como as comunidades locais no Pantanal, os fazendeiros, pescadores, e profissionais do turismo, e **todos concordaram que a hidrovia não deveria ser construida...**
Isso mudaria a sua opinião?

0 ☐ SIM, **AGORA É CONTRA** 1 ☐ NÃO, **AINDA A FAVOR** 88 ☐ *Recusado* 99 ☐ *Não sabe*

F4-b Independentemente da pergunta anterior, se o governo tivesse consultado com muitos **pesquisadores reconhecidos que recomendaram que não se deveria construir a hidrovia**...
Isso mudaria a sua opinião?

0 ☐ SIM, **AGORA É CONTRA** 1 ☐ NÃO, **AINDA A FAVOR** 88 ☐ *Recusado* 99 ☐ *Não sabe*

F4-c Independentemente da pergunta anterior, se o governo tivesse feito um levantamento e **pudesse confirmar que a maioria da população recusa a construção da hidrovia**...
Isso mudaria a sua opinião?

0 ☐ SIM, **AGORA É CONTRA** 1 ☐ NÃO, **AINDA A FAVOR** 88 ☐ *Recusado* 99 ☐ *Não sabe*

F4-d Independentemente da pergunta anterior, se fosse comprovado que a proposta da construção da hidrovia **não cumpre com todas as leis aplicáveis**, incluindo leis ambientais...
Isso mudaria a sua opinião?

0 ☐ SIM, **AGORA É CONTRA** 1 ☐ NÃO, **AINDA A FAVOR** 88 ☐ *Recusado* 99 ☐ *Não sabe*

F5 **!!!**
Seguir <u>aqui</u> se o entrevistado foi <u>contra</u> a hidrovia.
!!!

F5-a **Se o governo tivesse consultado com todos os grupos que estariam afetados**, como as comunidades locais no Pantanal, os fazendeiros, pescadores, e profissionais do turismo, e **todos concordaram que a hidrovia deveria ser construida...**
Isso mudaria a sua opinião?

0 ☐ NÃO, **AINDA É CONTRA** 1 ☐ SIM, **AGORA A FAVOR** 88 ☐ *Recusado* 99 ☐ *Não sabe*

F5-b Independentemente da pergunta anterior, se o governo tivesse consultado com muitos **pesquisadores reconhecidos que recomendaram que se deveria construir a hidrovia**...
Isso mudaria a sua opinião?

0 ☐ NÃO, **AINDA É CONTRA** 1 ☐ SIM, **AGORA A FAVOR** 88 ☐ *Recusado* 99 ☐ *Não sabe*

F5-c Independentemente da pergunta anterior, se o governo tivesse feito um levantamento e **pudesse confirmar que a maioria da população apoia a construção da hidrovia**...
Isso mudaria a sua opinião?

0 ☐ NÃO, **AINDA É CONTRA** 1 ☐ SIM, **AGORA A FAVOR** 88 ☐ *Recusado* 99 ☐ *Não sabe*

F5-d Independentemente da pergunta anterior, se fosse comprovado que a proposta da construção da hidrovia **cumpre com todas as leis aplicáveis**, incluindo leis ambientais...
Isso mudaria a sua opinião?

0 ☐ NÃO, **AINDA É CONTRA** 1 ☐ SIM, **AGORA A FAVOR** 88 ☐ *Recusado* 99 ☐ *Não sabe*

F6 Gostaria também de conhecer a **sua opinião sobre a construção de usinas hidrelétricas** aqui na região. Já existem 44 hidrelétricas e é previsto a construção de mais 110 na parte brasileira da Bacia do Rio Paraguai que inclui os rios próximos como o Rio Cuiabá, São Lourenço, Manso, Jaurú e Sepotuba.

70 % da energia elétrica no Brasil vem das hidrelétricas. Elas contaminam menos que a maioria das outras fontes de energia, como por exemplo as termoelétricas que usam carvão. Mas elas também mudam o fluxo natural das águas nos rios e cortam as rotas migratórias dos peixes. Isso resulta na **redução do número de peixes nos rios** e pescadores de hoje já têm dificuldades de se manter nos rios afetados.

Agora, foram propostas diferentes estratégias para diminuir este problema. Eu gostaria de saber qual das seguintes opções preferiria?

1 ☐ a) O governo apoia aos pescadores **construirem tanques para criar peixe** para eles assim **não dependerem da pesca no rio**. No futuro, eles se manteriam criando peixes em tanques e vendendo-os.

2 ☐ b) O governo **limita o número de usinas hidrelétricas** e assegura que alguns rios permaneçam sem elas. Nestes rios, os **pescadores poderiam continuar pescando** como no passado.

88 ☐ *Recusado* 99 ☐ *Não sabe*

F7 Finalmente, muitos pesquisadores acreditam que o maior problema relacionado à água aqui na região é **a poluição dos rios com esgoto doméstico não tratado**.

Isso pode causar problemas na saúde pública; reduzir a qualidade da água e fazer que seja mais difícil usar ela para consumo humano, pesca e lazer. Mas **melhorar saneamento e construir estações de tratamento de esgoto é muito caro.**

Aceitaria um aumento moderado na sua conta de água se o dinheiro for de fato usado para reduzir a poluição dos rios com esgoto?

0 ☐ **NÃO** ⇨ *Continuar com F8* 88 ☐ *Recusado* 99 ☐ *Não sabe*

1 ☐ **SIM** ⇨ *Continuar com F9* ⇨ *Continuar com F9*

F8 Por que votou que não?

Resposta
_____
_____
_____
_____

F9 Isso foi a última pergunta. Muito obrigado pelo seu tempo e por apoiar esta pesquisa! As suas respostas serão muito úteis para nos.
Que tenha um bom dia! / uma boa tarde! / uma boa noite!

PARTE G (para entrevistador)

G1 O entrevistado parecia confuso, desconcertado ou frustrado com o questionário ou cenários?

1 ☐ **Nunca** 2 ☐ **Poucas vezes** 3 ☐ **Várias vezes** 4 ☐ **Muitas vezes** 5 ☐ **Sempre**

G2 Sentia que o entrevistado tentava responder as perguntas com a maior boa vontade segundo as capacidades de ele?

1 ☐ **Nunca** 2 ☐ **Poucas vezes** 3 ☐ **Várias vezes** 4 ☐ **Muitas vezes** 5 ☐ **Sempre**

G3 Alguém estava interferindo com a entrevista (por exemplo interrompindo, discutindo ou contestando perguntas, mostrando impaciência)?

1 ☐ **Nunca** 2 ☐ **Uma vez** 3 ☐ **Duas vezes** 4 ☐ **3-5 vezes** 5 ☐ **Mais de 5 vezes**

G4 Gostaria de comentar alguma outra coisa sobre a entrevista (por exemplo problemas com perguntas específicas ou com o entrevistado)?

Resposta
_____
_____
_____
_____
_____
_____

Interviewer: _____ Questionnaire No (per interviewer): _____
Municipality: _____ Neighbourhood: _____
Census Tract (No): _____
Date: _____ Time (Start): _____ Time (End): _____

Good morning! / Good afternoon! / Good night!

My name is [...] and I am a student at the Federal University of Mato Grosso [*show student ID*].
I am working for a research project about water governance in Mato Grosso and it would be a great help if you could help us with this. Your participation would take about 30 minutes.

All your answers will be confidential and anonymous. We are interested in your opinions, **so there are no right or wrong answers**. The results of this research will only be used for academic purposes.

Would you agree to participate in our research?

☐ **NO** ⇨ No problem, anyway thanks very much for your attention!

☐ **YES** ⇨ Thanks very much!

PART A

To begin with, I have some questions about you. The main objective is to know whether the people we interview represent Mato Grosso's society well.

A1 Your gender is... *Only ask if it isn't obvious.*

☐ **Male** 1 ☐ **Female** 2 ☐ **Other** 3 ☐ *Refused* 88

A2 How long have you been living in Mato Grosso or when did you come to live here first?

Years: ☐ ☐ **Born in Mato Grosso**

A3 Please, could you let me know your age?

☐ **18-19** 1 ☐ **20-24** 2 ☐ **25-29** 3 ☐ **30-34** 4 ☐ **35-39** 5 ☐ **40-44** 6 ☐ **45-49** 7

☐ **50-54** 8 ☐ **55-59** 9 ☐ **60-64** 10 ☐ **65-69** 11 ☐ **70-74** 12 ☐ **75 or more** 13 ☐ *Refused* 88

A4 How many people live in your household?

☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐ **6+**

A household is a separate space (for example through walls or fences) with a roof that is inhabited by people who share all or the majority of their expenses and who do not need to cross another household to access their own space.

A5 What level of education did you complete?

☐ 1 **No formal education / incomplete primary school**

☐ 2 **Primary school complete / incomplete high school**

☐ 3 **High school complete / incomplete higher education**

☐ 4 **Complete higher education**

A6 / *A6-a* Are you currently working?

1 ☐ **YES** ⇨ *Continue with A7* 0 ☐ **NO** ⇨ *Continue with A6-b*

A6-b Why not?

1 ☐ **Retired** 2 ☐ **Student** 3 ☐ **Other**

A7 Do you have a water-related profession? Which?

☐ **NO** (0) ☐ **Agriculture/cattle ranching** (1) ☐ **Fishing** (2) ☐ **Tourism** (3) ☐ **Water supply** (4)
☐ **Research** (5) ☐ **Administration/regulation** (6) ☐ **Sanitation** (7) ☐ **Other:** _____ (8)

A8 Could you please let me know how much is the **monthly income of your household**? This means adding up the income of all the people in your home.

Please show the answer options to the respondent with the card S1.

If the respondent is hesitating, please explain that the income level is a very important information for the research. But don't insist too much either.

1 ☐ **Up to 1 minimum salary** < R$ 880 / month
2 ☐ **1-2 minimum salaries** R$ 880 - 1760 / month
3 ☐ **2-5 minimum salaries** R$ 1761 - 4400 / month
4 ☐ **5-10 minimum salaries** R$ 4401 - 8800 / month
5 ☐ **10-20 minimum salaries** R$ 8801 - 17600 / month
6 ☐ **More than 20 minimum salaries** > R$ 17600 / month

88 ☐ *Refused* 99 ☐ *Don't know*

A9 Could you please tell me your phone or mobile number? You might receive a phone call to verify the realisation of this interview. We are not going to pass your phone number to anyone.

Number: _____ ☐ *Refused* 88

PART B

B1 Now I would like to talk about the rivers and waterbodies of Mato Grosso.
I will mention 6 reasons why the rivers and waterbodies here are important, and I would like you to tell me which one is the most important one for you, **in your personal opinion:**

Please show the answer options to the respondent with the card S2.
Do not mention options "refused" and "don't know".

1 ☐ Traditional lifestyles, for example artisanal fishing or use of clay for ceramics, depend on rivers.

2 ☐ The state's economy depends on water abundance, especially for agriculture and cattle ranching.

3 ☐ The rivers sustain the nature of the Pantanal wetland.

4 ☐ Mato Grosso's culture has a strong relationship with the rivers and waterbodies, for example during traditional festivities.

5 ☐ The rivers produce almost all electric energy that is used in Mato Grosso.

6 ☐ The rivers and waterbodies are important for the survival of wildlife, for example jaguars, birds, caimans etc.

88 ☐ *Refused* 99 ☐ *Don't know* ⇨ *If the answer was "refused" or "don't know" continue with part C (but try to avoid this if possible!)*

B2 Now, that you mentioned [*reread the topic chosen as an answer in B1*] as the most important topic: please compare with the other topics, what is the level of importance?

Do not repeat the reason that the respondent has already selected as most important.
Please show the answer options to the respondent with the card S3.
Do not mention options "refused" and "don't know".

B2-a Traditional lifestyles, for example artisanal fishing or use of clay for ceramics, depend on rivers.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-b The state's economy depends on water abundance, especially for agriculture and cattle r.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-c The rivers sustain the nature of the Pantanal wetland.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-d Mato Grosso's culture has a strong relationship with the rivers and waterbodies, for example during traditional festivities.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-e The rivers produce almost all electric energy that is used in Mato Grosso.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

B2-f The rivers and waterbodies are important for the survival of wildlife, for example jaguars, birds, caimans etc.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

PART C

C1 Now I would like to know your opinions about some **principles that could guide the authorities when they take decisions about water.**

Please tell me which of the following principles should be **the most important** for the authorities, in your opinion?

Please show the answer options to the respondent with the card S4.
Read aloud slowly two times, especially if the respondent has difficulties reading card S4.
Do not mention options "refused" and "don't know".

1 ☐ Think about the impact for future generations.

2 ☐ Not to waste public money.

3 ☐ Follow the opinion of the majority of the population.

4 ☐ Consult studies and experts.

5 ☐ Care about the poor and minorities.

6 ☐ Ensure the political participation of those that are affected.

7 ☐ Everything follows the law.

88 ☐ *Refused* 99 ☐ *Don't know* ⇨ *If the answer was "refused" or "don't know" continue with part D (but try to avoid this if possible!)*

C2 Now, that you mentioned [*reread the principle chosen as an answer in C1*] as the most important principle: please compare with the other principles, what is the level of importance?

Do not repeat the principle that the respondent has already selected as most important.
Please show the answer options to the respondent with the card S3.
Do not mention options "refused" and "don't know".

C2-a Think about the impact for future generations.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-b Not to waste public money.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-c Follow the opinion of the majority of the population.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-d Consult studies and experts.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-e Care about the poor and minorities.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-f Ensure the political participation of those that are affected.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C2-g Everyone follows the law.

equally important	**almost as important**	**a bit less important**	**much less important**	**not important**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3 To conclude this part, I would like to know, how much are you satisfied with the authorities with respect to these principles? Please tell me how much you agree or disagree with the following statements.

Please show the answer options to the respondent with the card S5.
Do not mention options "refused" and "don't know".

C3-a The authorities think about the impact for future generations.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-b The authorities do not waste public money.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-c The authorities follow the opinion of the majority of the population.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-d The authorities consult studies and experts.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-e The authorities care about the poor and minorities.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-f The authorities ensure the political participation of those that are affected.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

C3-g The authorities follow the law.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

PART D

D1 The following questions are not going to be about water, but they will help to understand why people have certain opinions.
I will describe people with different characteristics and will ask you to tell me how much each of these people is or is not similar to you.

Please show the answer options to the respondent with the card S6.
Do not mention options "refused" and "don't know".

D1-a A person to whom thinking up new ideas and being creative is important. They like to do things in their own original way.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused* / *Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐ / 99 ☐

D1-b A person to whom it is important to be rich. They want to have a lot of money and expensive things.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused* / *Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐ / 99 ☐

D1-c A person who thinks that it is important that every person in the world should be treated equally. They believe everyone should have equal opportunities in life.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused* / *Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐ / 99 ☐

D1-d A person for whom it is important to show their abilities. They want people to admire what they do.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-e A person for whom it is important to live in secure surroundings. They avoid anything that might endanger their safety.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-f A person who likes surprises and is always looking for new things to do. They think it is important to do lots of different things in life.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-g A person who believes that people should do what they are told. They think people should follow rules at all times, even when no one is watching.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-h A person for whom it is important to listen to people who are different to them. Even when they disagree with someone, they still want to understand them.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-i A person for whom it is important to be humble and modest. They try not to draw attention to themselves.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-j A person for whom having a good time is important. They like to "spoil" themselves.

Exactly like me	**Very much like me**	**Like me**	**A little like me**	**Not like me**	**Not like me at all**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-k A person to whom it is important to make their own decisions. They like to be free and not depend on others.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-l A person to whom it is important to help the people around them. They want to care for their well-being.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-m A person to whom being successful is very important. They hope people will recognise their achievements.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-n A person for whom it is important that the government ensures their safety against all threats. They want the state to maintain social order.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-o A person who looks for adventure and likes to take risks. They want to have an exciting life.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-p A person for whom it is important always to behave properly. They avoid doing anything people would say is wrong.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-q A person for whom it is important to be able to lead. They want people to do what he or she says.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-r A person for whom it is important to be loyal to their friends. They devote themselves to people close to them.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-s A person who strongly believes that people should care for nature. Looking after the environment is important to them.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-t A person for whom traditions are important. They do everything they can to follow the customs handed down by their religion or their family.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

D1-u A person who seeks every chance they can to have fun. It is important to them to do things that give them pleasure.

Exactly like me	Very much like me	Like me	A little like me	Not like me	Not like me at all	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	88 ☐	99 ☐

PART E

E1 Now, a different topic: Do you know about water-related issues here in your municipality?

☐ 0 **NO** ⇨ *Continue with question E3*

☐ 1 **YES** ⇨ *Continue with question E2*

88 ☐ 99 ☐ ⇨ *Question E3*

E2 What issues do you remember?

Please do not give suggestions. Multiple answers possible.
Give time to think.

Answer

_____
_____
_____
_____
_____
_____
_____

E3 Here I have a list of issues that other people have mentioned.
Tell me please: to what level do they affect **your municipality?**

Please show the answer options to the respondent with the card S7.
Do not mention options "refused" and "don't know".

E3-a Droughts and dry periods:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-b Floods and inundations:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-c Pollution with sewage and lacking basic sanitation:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-d Pollution with pesticides and fertilisers:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-e Pollution with toxic elements used in mining:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-f Problems with domestic water supply, for example low quality, or deficient and absent water supply:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-g Administrative problems with water supply, for example with water charges, delays, or erroneous charges:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-h Management problems in the water company, for example corruption or bankruptcy:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-i Illegal pipes and connections with the water supply network:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-j Climate change, for example rainfall outside the normal season:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-k Environmental destruction:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-l Lack of environmental awareness:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-m Diminishing fish numbers:

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

E3-n Problems with hydroelectric power stations:*

Not a problem	**Minor problem**	**Major problem**	**Enormous problem**	*Refused*	*Don't know*
1 ☐	2 ☐	3 ☐	4 ☐	88 ☐	99 ☐

**Register which problems if the respondent mentions it.*

E3-o *Optional answer (which are the problems with hydroelectric power stations)*

_____
_____
_____
_____

E4 Are you actively involved in any of these issues? That means, are you trying to contribute to diminishing the problem at work or as a citizen, for example through activism, better practices or awareness creation?

0 ☐ **NO** ⇨ *Continue with part F* 88 ☐ *Refused* 99 ☐ *Don't know*

1 ☐ **YES** ⇨ *Continue with question E5* ⇨ *Continue with part F*

E5 Which activities do you carry out in relation to what you said? Are you doing this for your work or as a citizen?

Answer

_____
_____
_____
_____

PART F

F1 Now I would like to know your opinion about a water-related project. Have you heard already about the proposal to build a waterway through the Pantanal, on the Paraguay River, beginning near Cáceres?

0 ☐ **NO** ⇨ *Continue with F1-a* 1 ☐ **YES** ⇨ *Continue with F2*

F1-a The waterway will use the river for the transport of products with commercial vessels.

F2

The main objective of the waterway is to facilitate the export of soybeans, corn and other products, because it is cheaper to transport them on the river rather than on the highways to the ports on the Brazilian coast. Once the waterway is built, it will benefit the agribusiness sector and for that reason it is likely that agriculture will grow more.

But there are also concerns that the waterway could have a negative impact on the Pantanal. Scientists expect that fish numbers will decrease, that the natural environment will be damaged and that it will be more difficult for the local fishermen and small-scale farmers to sustain themselves.

Now, imagine that the government would do a referendum about the waterway. **Would you vote in favour or against** the construction of the waterway?

Do not mention options "refused" and "don't know".

1 ☐ **FOR** ⇨ *After F3 continue with F4*

0 ☐ **AGAINST** ⇨ **!!!** ***After F3 continue with F5*** **!!!**

Refused 88☐ *Don't know* 99☐

F3 ***Everyone answers F3***

Please tell me how much you agree or disagree with the following statements:

Please show the answer options to the respondent with the card S5.
Do not mention options "refused" and "don't know".

F3-a Building the waterway will be good for Mato Grosso in the long term.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5☐	4☐	3☐	2☐	1☐	88☐	99☐

F3-b Building the waterway will have negative impacts on minorities.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5☐	4☐	3☐	2☐	1☐	88☐	99☐

F3-c Public money will be well spent on the construction of the waterway.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5☐	4☐	3☐	2☐	1☐	88☐	99☐

F3-d The waterway will have negative effects on future generations.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5☐	4☐	3☐	2☐	1☐	88☐	99☐

F3-e The waterway will help remove people from poverty.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5☐	4☐	3☐	2☐	1☐	88☐	99☐

F3-f The construction of the waterway will be a waste of public money.

Totally agree	**Partly agree**	**Maybe**	**Partly disagree**	**Totally disagree**	*Refused*	*Don't know*
5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	88 ☐	99 ☐

F4 ***Continue <u>here</u> if the respondent was <u>in favour</u> of the waterway.***
Continue <u>with F5</u> if the respondent was <u>against</u> the waterway!

F4-a **If the government had consulted with all the affected groups,** such as the local communities in the Pantanal, the farmers, fishermen, and tourism workers, and **all had agreed that the waterway should not be built...**
Would this change your opinion?

0 ☐ YES, **NOW AGAINST** 1 ☐ NO, **STILL IN FAVOUR** 88 ☐ *Refused* 99 ☐ *Don't know*

F4-b Independent of the previous question, if the government had consulted with many **recognised researchers who had recommended that the waterway should not be built...**
Would this change your opinion?

0 ☐ YES, **NOW AGAINST** 1 ☐ NO, **STILL IN FAVOUR** 88 ☐ *Refused* 99 ☐ *Don't know*

F4-c Independent of the previous question, if the government had conducted a survey and **could confirm that the majority of the population opposes the construction of the waterway...**
Would this change your opinion?

0 ☐ YES, **NOW AGAINST** 1 ☐ NO, **STILL IN FAVOUR** 88 ☐ *Refused* 99 ☐ *Don't know*

F4-d Independent of the previous question, if it was proven that the proposal for the construction of the waterway **does not comply with all the applicable laws**, including environmental laws...
Would this change your opinion?

0 ☐ YES, **NOW AGAINST** 1 ☐ NO, **STILL IN FAVOUR** 88 ☐ *Refused* 99 ☐ *Don't know*

F5 **!!!**
Continue <u>here</u> if the respondent was <u>against</u> the waterway.
!!!

F5-a **If the government had consulted with all the affected groups,** such as the local communities in the Pantanal, the farmers, fishermen, and tourism workers, and **all had agreed that the waterway should be built...**
Would this change your opinion?

0 ☐ NO, **STILL AGAINST** 1 ☐ YES, **NOW IN FAVOUR** 88 ☐ *Refused* 99 ☐ *Don't know*

F5-b Independent of the previous question, if the government had consulted with many **recognised researchers who had recommended that the waterway should be built...**
Would this change your opinion?

0 ☐ NO, **STILL AGAINST** 1 ☐ YES, **NOW IN FAVOUR** 88 ☐ *Refused* 99 ☐ *Don't know*

F5-c Independent of the previous question, if the government had conducted a survey and **could confirm that the majority of the population supports the construction of the waterway...**
Would this change your opinion?

0 ☐ NO, **STILL AGAINST** 1 ☐ YES, **NOW IN FAVOUR** 88 ☐ *Refused* 99 ☐ *Don't know*

F5-d Independent of the previous question, if it was proven that the proposal for the construction of the waterway **does comply with all the applicable laws**, including environmental laws...
Would this change your opinion?

0 ☐ NO, **STILL AGAINST** 1 ☐ YES, **NOW IN FAVOUR** 88 ☐ *Refused* 99 ☐ *Don't know*

F6 I would also like to know **your opinion about the construction of hydroelectric power stations** here in the region. There are already 44 hydropower stations and the construction of another 110 is planned in the Brazilian part of the Paraguay River Basin which includes the nearby rivers such as the Cuiabá River, São Lourenço, Manso, Jauru, and Sepotuba.

70% of Brazil's electric energy comes from hydropower. It pollutes less than the majority of the other energy sources, like for example the thermal power stations which use coal. But it also changes the natural flow of water in the rivers and interrupts fish migratory routes. This results in a **decrease in fish numbers in rivers** and today's fishermen already have difficulties maintaining themselves in the affected rivers.

Now, several different strategies have been proposed to diminish this problem. I would like to know which of the following options you would prefer?

1 ☐ a) The government helps the fishermen **to build fish tanks to raise fish** so that **they do not depend on fishing in the river.** In the future, they would maintain themselves by raising fish in tanks and selling them.

2 ☐ b) The government **limits the number of hydroelectric power stations** and ensures that some rivers remain without them. In those rivers, the **fishermen could continue fishing** like in the past.

88 ☐ *Refused* 99 ☐ *Don't know*

F7 Finally, many researchers believe that the major water-related problem here in the region is **the pollution of rivers with untreated domestic sewage.**

This can cause problems for public health; reduce water quality and cause that it is more difficult to use water for human consumption, fishing and recreation. But **improving sanitation and building sewage treatment plants is very expensive.**

Would you accept a moderate increase of your water bill if the money was definitely used to reduce the pollution of rivers with sewage?

0 ☐ **NO** ⇨ *Continue with F8* 88 ☐ *Refused* 99 ☐ *Don't know*

1 ☐ **YES** ⇨ *Continue with F9* ⇨ *Continue with F9*

F8 Why did you choose "no"?

Answer

_____
_____
_____
_____

F9 That was the last question. Many thanks for your time and for supporting this research! Your answers are going to be very useful for us.
Have a good day! / a good afternoon! / a good night!

PART G (for the interviewer)

G1 Did the respondent seem confused, disturbed or frustrated with the questionnaire or the scenarios?

1 ☐ **Never** 2 ☐ **A few times** 3 ☐ **Several times** 4 ☐ **Many times** 5 ☐ **Always**

G2 Did you feel that the respondent was trying to answer the questions with the best will according to their capacities?

1 ☐ **Never** 2 ☐ **A few times** 3 ☐ **Several times** 4 ☐ **Many times** 5 ☐ **Always**

G3 Was anyone interfering with the interview (for example interrupting, discussing or questioning questions, showing impatience)?

1 ☐ **Never** 2 ☐ **Once** 3 ☐ **Twice** 4 ☐ **3-5 times** 5 ☐ **More than 5 times**

G4 Would you like to comment about anything else with regard to the interview (for example problems with specific questions or with the respondent)?

Answer

_____
_____
_____
_____
_____
_____

Appendix C:
Lavaan Codes

C.1 Lavaan code and full summary of CFA fundamental values

CFA_FV.txt

```
cfa_fv <- '
# latent variables
fv_univ =~ fv_univ1 + fv_univ2 + fv_univ3
fv_benev =~ fv_benev1 + fv_benev2
fv_conf =~ fv_conf1 + fv_conf2
fv_trad =~ fv_trad1 + fv_trad2
fv_secur =~ fv_secur1 + fv_secur2
fv_power =~ fv_power1 + fv_power2
fv_achiev =~ fv_achiev1 + fv_achiev2
fv_hedon =~ fv_hedon1 + fv_hedon2
fv_stim =~ fv_stim1 + fv_stim2
fv_selfd =~ fv_selfd1 + fv_selfd2
'

fit <- cfa(cfa_fv, data=X170310_watervaluesR,
ordered=c("fv_univ1","fv_univ2","fv_univ3","fv_benev1","fv_benev2","fv_conf1","f
v_conf2","fv_trad1","fv_trad2","fv_secur1","fv_secur2","fv_power1","fv_power2","
fv_achiev1","fv_achiev2","fv_hedon1","fv_hedon2","fv_stim1","fv_stim2","fv_selfd
1","fv_selfd2"))

summary(fit, fit.measures=TRUE, standardized=TRUE)

> summary(fit, fit.measures=TRUE, standardized=TRUE)
lavaan (0.5-23.1097) converged normally after  63 iterations

                                                  Used       Total
  Number of observations                          1051        1067

  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic               641.897     759.265
  Degrees of freedom                                144         144
  P-value (Chi-square)                            0.000       0.000
  Scaling correction factor                                   0.880
  Shift parameter                                            29.926
    for simple second-order correction (Mplus variant)

Model test baseline model:

  Minimum Function Test Statistic             15564.851    9590.324
  Degrees of freedom                                210         210
  P-value                                         0.000       0.000

User model versus baseline model:

  Comparative Fit Index (CFI)                     0.968       0.934
  Tucker-Lewis Index (TLI)                        0.953       0.904

  Robust Comparative Fit Index (CFI)                             NA
  Robust Tucker-Lewis Index (TLI)                                NA

Root Mean Square Error of Approximation:

  RMSEA                                           0.057       0.064
  90 Percent Confidence Interval          0.053   0.062       0.059  0.068
  P-value RMSEA <= 0.05                           0.004       0.000

  Robust RMSEA                                                   NA
  90 Percent Confidence Interval                                 NA      NA

Standardized Root Mean Square Residual:

  SRMR                                            0.053       0.053

Weighted Root Mean Square Residual:

  WRMR                                            1.428       1.428

Parameter Estimates:
```

CFA_FV.txt

Information Expected
Standard Errors Robust.sem

Latent Variables:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ =~						
fv_univ1	1.000				0.566	0.566
fv_univ2	0.982	0.062	15.836	0.000	0.556	0.556
fv_univ3	1.281	0.069	18.679	0.000	0.725	0.725
fv_benev =~						
fv_benev1	1.000				0.723	0.723
fv_benev2	0.995	0.040	24.682	0.000	0.719	0.719
fv_conf =~						
fv_conf1	1.000				0.388	0.388
fv_conf2	1.240	0.133	9.333	0.000	0.481	0.481
fv_trad =~						
fv_trad1	1.000				0.656	0.656
fv_trad2	0.750	0.038	19.649	0.000	0.492	0.492
fv_secur =~						
fv_secur1	1.000				0.664	0.664
fv_secur2	0.964	0.049	19.574	0.000	0.640	0.640
fv_power =~						
fv_power1	1.000				0.477	0.477
fv_power2	1.052	0.129	8.159	0.000	0.501	0.501
fv_achiev =~						
fv_achiev1	1.000				0.644	0.644
fv_achiev2	1.249	0.083	14.976	0.000	0.804	0.804
fv_hedon =~						
fv_hedon1	1.000				0.672	0.672
fv_hedon2	0.837	0.055	15.342	0.000	0.563	0.563
fv_stim =~						
fv_stim1	1.000				1.315	1.315
fv_stim2	0.120	0.071	1.702	0.089	0.158	0.158
fv_selfd =~						
fv_selfd1	1.000				0.560	0.560
fv_selfd2	0.706	0.079	8.955	0.000	0.395	0.395

Covariances:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ ~~						
fv_benev	0.397	0.024	16.829	0.000	0.970	0.970
fv_conf	0.142	0.018	8.000	0.000	0.645	0.645
fv_trad	0.403	0.024	16.516	0.000	1.086	1.086
fv_secur	0.318	0.023	13.935	0.000	0.844	0.844
fv_power	-0.070	0.017	-4.047	0.000	-0.260	-0.260
fv_achiev	0.121	0.018	6.862	0.000	0.331	0.331
fv_hedon	0.234	0.020	11.555	0.000	0.616	0.616
fv_stim	0.183	0.023	8.053	0.000	0.245	0.245
fv_selfd	0.204	0.022	9.176	0.000	0.644	0.644
fv_benev ~~						
fv_conf	0.186	0.023	8.039	0.000	0.664	0.664
fv_trad	0.466	0.021	22.048	0.000	0.984	0.984
fv_secur	0.381	0.022	17.602	0.000	0.794	0.794
fv_power	-0.021	0.022	-0.956	0.339	-0.060	-0.060
fv_achiev	0.146	0.020	7.171	0.000	0.313	0.313
fv_hedon	0.324	0.022	14.422	0.000	0.666	0.666
fv_stim	0.190	0.026	7.192	0.000	0.200	0.200
fv_selfd	0.316	0.025	12.839	0.000	0.781	0.781
fv_conf ~~						
fv_trad	0.264	0.026	10.176	0.000	1.039	1.039
fv_secur	0.205	0.022	9.231	0.000	0.796	0.796
fv_power	0.047	0.017	2.766	0.006	0.253	0.253
fv_achiev	0.099	0.016	6.056	0.000	0.397	0.397
fv_hedon	0.087	0.019	4.622	0.000	0.334	0.334
fv_stim	0.048	0.020	2.355	0.019	0.094	0.094
fv_selfd	0.088	0.019	4.518	0.000	0.403	0.403
fv_trad ~~						

```
                                CFA_FV.txt
    fv_secur          0.386    0.023   16.797    0.000    0.886    0.886
    fv_power         -0.072    0.023   -3.169    0.002   -0.232   -0.232
    fv_achiev         0.186    0.022    8.573    0.000    0.440    0.440
    fv_hedon          0.292    0.023   12.763    0.000    0.663    0.663
    fv_stim           0.179    0.029    6.215    0.000    0.208    0.208
    fv_selfd          0.236    0.025    9.639    0.000    0.644    0.644
  fv_secur ~~
    fv_power          0.001    0.021    0.054    0.957    0.004    0.004
    fv_achiev         0.203    0.022    9.365    0.000    0.475    0.475
    fv_hedon          0.265    0.022   11.863    0.000    0.594    0.594
    fv_stim           0.212    0.026    8.175    0.000    0.243    0.243
    fv_selfd          0.219    0.024    9.267    0.000    0.588    0.588
  fv_power ~~
    fv_achiev         0.178    0.023    7.597    0.000    0.581    0.581
    fv_hedon          0.133    0.024    5.664    0.000    0.417    0.417
    fv_stim           0.095    0.025    3.787    0.000    0.152    0.152
    fv_selfd          0.065    0.022    2.927    0.003    0.244    0.244
  fv_achiev ~~
    fv_hedon          0.282    0.023   12.187    0.000    0.651    0.651
    fv_stim           0.262    0.024   10.816    0.000    0.310    0.310
    fv_selfd          0.148    0.022    6.813    0.000    0.410    0.410
  fv_hedon ~~
    fv_stim           0.358    0.025   14.314    0.000    0.405    0.405
    fv_selfd          0.270    0.026   10.542    0.000    0.717    0.717
  fv_stim ~~
    fv_selfd          0.259    0.027    9.528    0.000    0.351    0.351

Intercepts:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
   .fv_univ1          0.000                              0.000    0.000
   .fv_univ2          0.000                              0.000    0.000
   .fv_univ3          0.000                              0.000    0.000
   .fv_benev1         0.000                              0.000    0.000
   .fv_benev2         0.000                              0.000    0.000
   .fv_conf1          0.000                              0.000    0.000
   .fv_conf2          0.000                              0.000    0.000
   .fv_trad1          0.000                              0.000    0.000
   .fv_trad2          0.000                              0.000    0.000
   .fv_secur1         0.000                              0.000    0.000
   .fv_secur2         0.000                              0.000    0.000
   .fv_power1         0.000                              0.000    0.000
   .fv_power2         0.000                              0.000    0.000
   .fv_achiev1        0.000                              0.000    0.000
   .fv_achiev2        0.000                              0.000    0.000
   .fv_hedon1         0.000                              0.000    0.000
   .fv_hedon2         0.000                              0.000    0.000
   .fv_stim1          0.000                              0.000    0.000
   .fv_stim2          0.000                              0.000    0.000
   .fv_selfd1         0.000                              0.000    0.000
   .fv_selfd2         0.000                              0.000    0.000
    fv_univ           0.000                              0.000    0.000
    fv_benev          0.000                              0.000    0.000
    fv_conf           0.000                              0.000    0.000
    fv_trad           0.000                              0.000    0.000
    fv_secur          0.000                              0.000    0.000
    fv_power          0.000                              0.000    0.000
    fv_achiev         0.000                              0.000    0.000
    fv_hedon          0.000                              0.000    0.000
    fv_stim           0.000                              0.000    0.000
    fv_selfd          0.000                              0.000    0.000

Thresholds:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
    fv_univ1|t1      -2.245    0.106  -21.109    0.000   -2.245   -2.245
    fv_univ1|t2      -1.762    0.071  -24.903    0.000   -1.762   -1.762
    fv_univ1|t3      -1.466    0.058  -25.142    0.000   -1.466   -1.466
    fv_univ1|t4      -0.792    0.043  -18.244    0.000   -0.792   -0.792
    fv_univ1|t5      -0.247    0.039   -6.314    0.000   -0.247   -0.247
                                Page 3
```

CFA_FV.txt

fv_univ2|t1	-2.217	0.103	-21.420	0.000	-2.217	-2.217
fv_univ2|t2	-1.480	0.059	-25.174	0.000	-1.480	-1.480
fv_univ2|t3	-0.909	0.045	-20.159	0.000	-0.909	-0.909
fv_univ2|t4	-0.162	0.039	-4.161	0.000	-0.162	-0.162
fv_univ2|t5	0.388	0.040	9.748	0.000	0.388	0.388
fv_univ3|t1	-2.669	0.168	-15.914	0.000	-2.669	-2.669
fv_univ3|t2	-2.217	0.103	-21.420	0.000	-2.217	-2.217
fv_univ3|t3	-1.614	0.064	-25.259	0.000	-1.614	-1.614
fv_univ3|t4	-0.786	0.043	-18.129	0.000	-0.786	-0.786
fv_univ3|t5	-0.176	0.039	-4.530	0.000	-0.176	-0.176
fv_benev1|t1	-2.669	0.168	-15.914	0.000	-2.669	-2.669
fv_benev1|t2	-2.190	0.101	-21.706	0.000	-2.190	-2.190
fv_benev1|t3	-1.597	0.063	-25.270	0.000	-1.597	-1.597
fv_benev1|t4	-0.612	0.041	-14.775	0.000	-0.612	-0.612
fv_benev1|t5	0.037	0.039	0.956	0.339	0.037	0.037
fv_benev2|t1	-2.475	0.135	-18.389	0.000	-2.475	-2.475
fv_benev2|t2	-1.933	0.081	-23.971	0.000	-1.933	-1.933
fv_benev2|t3	-1.473	0.059	-25.158	0.000	-1.473	-1.473
fv_benev2|t4	-0.704	0.042	-16.615	0.000	-0.704	-0.704
fv_benev2|t5	-0.035	0.039	-0.894	0.371	-0.035	-0.035
fv_conf1|t1	-1.120	0.049	-22.895	0.000	-1.120	-1.120
fv_conf1|t2	-0.512	0.041	-12.608	0.000	-0.512	-0.512
fv_conf1|t3	-0.179	0.039	-4.592	0.000	-0.179	-0.179
fv_conf1|t4	0.364	0.040	9.198	0.000	0.364	0.364
fv_conf1|t5	0.773	0.043	17.898	0.000	0.773	0.773
fv_conf2|t1	-1.459	0.058	-25.124	0.000	-1.459	-1.459
fv_conf2|t2	-0.792	0.043	-18.244	0.000	-0.792	-0.792
fv_conf2|t3	-0.286	0.039	-7.297	0.000	-0.286	-0.286
fv_conf2|t4	0.262	0.039	6.683	0.000	0.262	0.262
fv_conf2|t5	0.719	0.043	16.908	0.000	0.719	0.719
fv_trad1|t1	-2.245	0.106	-21.109	0.000	-2.245	-2.245
fv_trad1|t2	-1.797	0.073	-24.755	0.000	-1.797	-1.797
fv_trad1|t3	-1.299	0.053	-24.405	0.000	-1.299	-1.299
fv_trad1|t4	-0.400	0.040	-10.054	0.000	-0.400	-0.400
fv_trad1|t5	0.123	0.039	3.175	0.001	0.123	0.123
fv_trad2|t1	-1.847	0.075	-24.503	0.000	-1.847	-1.847
fv_trad2|t2	-1.333	0.054	-24.608	0.000	-1.333	-1.333
fv_trad2|t3	-0.846	0.044	-19.155	0.000	-0.846	-0.846
fv_trad2|t4	-0.210	0.039	-5.392	0.000	-0.210	-0.210
fv_trad2|t5	0.289	0.039	7.359	0.000	0.289	0.289
fv_secur1|t1	-2.217	0.103	-21.420	0.000	-2.217	-2.217
fv_secur1|t2	-1.688	0.067	-25.137	0.000	-1.688	-1.688
fv_secur1|t3	-1.230	0.051	-23.910	0.000	-1.230	-1.230
fv_secur1|t4	-0.453	0.040	-11.273	0.000	-0.453	-0.453
fv_secur1|t5	0.109	0.039	2.805	0.005	0.109	0.109
fv_secur2|t1	-1.981	0.084	-23.615	0.000	-1.981	-1.981
fv_secur2|t2	-1.412	0.057	-24.976	0.000	-1.412	-1.412
fv_secur2|t3	-0.902	0.045	-20.049	0.000	-0.902	-0.902
fv_secur2|t4	-0.235	0.039	-6.007	0.000	-0.235	-0.235
fv_secur2|t5	0.296	0.039	7.543	0.000	0.296	0.296
fv_power1|t1	-0.150	0.039	-3.853	0.000	-0.150	-0.150
fv_power1|t2	0.870	0.044	19.549	0.000	0.870	0.870
fv_power1|t3	1.315	0.054	24.508	0.000	1.315	1.315
fv_power1|t4	1.762	0.071	24.903	0.000	1.762	1.762
fv_power1|t5	2.016	0.086	23.334	0.000	2.016	2.016
fv_power2|t1	-0.873	0.045	-19.605	0.000	-0.873	-0.873
fv_power2|t2	-0.128	0.039	-3.298	0.001	-0.128	-0.128
fv_power2|t3	0.284	0.039	7.236	0.000	0.284	0.284
fv_power2|t4	0.751	0.043	17.492	0.000	0.751	0.751
fv_power2|t5	1.161	0.050	23.309	0.000	1.161	1.161
fv_achiev1|t1	-1.466	0.058	-25.142	0.000	-1.466	-1.466
fv_achiev1|t2	-0.809	0.044	-18.530	0.000	-0.809	-0.809
fv_achiev1|t3	-0.291	0.039	-7.420	0.000	-0.291	-0.291
fv_achiev1|t4	0.304	0.039	7.727	0.000	0.304	0.304
fv_achiev1|t5	0.741	0.043	17.317	0.000	0.741	0.741
fv_achiev2|t1	-1.438	0.057	-25.066	0.000	-1.438	-1.438
fv_achiev2|t2	-0.842	0.044	-19.099	0.000	-0.842	-0.842
fv_achiev2|t3	-0.299	0.039	-7.604	0.000	-0.299	-0.299

```
                                CFA_FV.txt
    fv_achiev2|t4     0.326    0.039    8.279    0.000    0.326    0.326
    fv_achiev2|t5     0.757    0.043   17.608    0.000    0.757    0.757
    fv_hedon1|t1     -1.888    0.078  -24.263    0.000   -1.888   -1.888
    fv_hedon1|t2     -1.321    0.054  -24.542    0.000   -1.321   -1.321
    fv_hedon1|t3     -0.836    0.044  -18.986    0.000   -0.836   -0.836
    fv_hedon1|t4     -0.154    0.039   -3.976    0.000   -0.154   -0.154
    fv_hedon1|t5      0.334    0.039    8.463    0.000    0.334    0.334
    fv_hedon2|t1     -1.473    0.059  -25.158    0.000   -1.473   -1.473
    fv_hedon2|t2     -0.839    0.044  -19.042    0.000   -0.839   -0.839
    fv_hedon2|t3     -0.352    0.040   -8.892    0.000   -0.352   -0.352
    fv_hedon2|t4      0.191    0.039    4.899    0.000    0.191    0.191
    fv_hedon2|t5      0.589    0.041   14.296    0.000    0.589    0.589
    fv_stim1|t1      -1.580    0.063  -25.275    0.000   -1.580   -1.580
    fv_stim1|t2      -0.819    0.044  -18.702    0.000   -0.819   -0.819
    fv_stim1|t3      -0.329    0.039   -8.340    0.000   -0.329   -0.329
    fv_stim1|t4       0.254    0.039    6.499    0.000    0.254    0.254
    fv_stim1|t5       0.674    0.042   16.025    0.000    0.674    0.674
    fv_stim2|t1      -0.099    0.039   -2.559    0.011   -0.099   -0.099
    fv_stim2|t2       0.618    0.041   14.895    0.000    0.618    0.618
    fv_stim2|t3       0.968    0.046   21.025    0.000    0.968    0.968
    fv_stim2|t4       1.293    0.053   24.369    0.000    1.293    1.293
    fv_stim2|t5       1.632    0.065   25.240    0.000    1.632    1.632
    fv_selfd1|t1     -1.632    0.065  -25.240    0.000   -1.632   -1.632
    fv_selfd1|t2     -1.138    0.049  -23.081    0.000   -1.138   -1.138
    fv_selfd1|t3     -0.455    0.040  -11.334    0.000   -0.455   -0.455
    fv_selfd1|t4      0.242    0.039    6.191    0.000    0.242    0.242
    fv_selfd1|t5      0.671    0.042   15.966    0.000    0.671    0.671
    fv_selfd2|t1     -1.964    0.083  -23.741    0.000   -1.964   -1.964
    fv_selfd2|t2     -1.299    0.053  -24.405    0.000   -1.299   -1.299
    fv_selfd2|t3     -0.891    0.045  -19.883    0.000   -0.891   -0.891
    fv_selfd2|t4     -0.291    0.039   -7.420    0.000   -0.291   -0.291
    fv_selfd2|t5      0.140    0.039    3.606    0.000    0.140    0.140

Variances:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
   .fv_univ1          0.680                               0.680    0.680
   .fv_univ2          0.691                               0.691    0.691
   .fv_univ3          0.474                               0.474    0.474
   .fv_benev1         0.477                               0.477    0.477
   .fv_benev2         0.482                               0.482    0.482
   .fv_conf1          0.849                               0.849    0.849
   .fv_conf2          0.768                               0.768    0.768
   .fv_trad1          0.570                               0.570    0.570
   .fv_trad2          0.758                               0.758    0.758
   .fv_secur1         0.559                               0.559    0.559
   .fv_secur2         0.590                               0.590    0.590
   .fv_power1         0.773                               0.773    0.773
   .fv_power2         0.749                               0.749    0.749
   .fv_achiev1        0.585                               0.585    0.585
   .fv_achiev2        0.354                               0.354    0.354
   .fv_hedon1         0.549                               0.549    0.549
   .fv_hedon2         0.684                               0.684    0.684
   .fv_stim1         -0.730                              -0.730   -0.730
   .fv_stim2          0.975                               0.975    0.975
   .fv_selfd1         0.687                               0.687    0.687
   .fv_selfd2         0.844                               0.844    0.844
    fv_univ           0.320    0.031   10.217    0.000    1.000    1.000
    fv_benev          0.523    0.030   17.212    0.000    1.000    1.000
    fv_conf           0.151    0.029    5.242    0.000    1.000    1.000
    fv_trad           0.430    0.039   10.976    0.000    1.000    1.000
    fv_secur          0.441    0.035   12.758    0.000    1.000    1.000
    fv_power          0.227    0.041    5.488    0.000    1.000    1.000
    fv_achiev         0.415    0.035   11.961    0.000    1.000    1.000
    fv_hedon          0.451    0.041   10.911    0.000    1.000    1.000
    fv_stim           1.730    0.944    1.832    0.067    1.000    1.000
    fv_selfd          0.313    0.048    6.468    0.000    1.000    1.000

Scales y*:
                                Page 5
```

CFA_FV.txt

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ1	1.000				1.000	1.000
fv_univ2	1.000				1.000	1.000
fv_univ3	1.000				1.000	1.000
fv_benev1	1.000				1.000	1.000
fv_benev2	1.000				1.000	1.000
fv_conf1	1.000				1.000	1.000
fv_conf2	1.000				1.000	1.000
fv_trad1	1.000				1.000	1.000
fv_trad2	1.000				1.000	1.000
fv_secur1	1.000				1.000	1.000
fv_secur2	1.000				1.000	1.000
fv_power1	1.000				1.000	1.000
fv_power2	1.000				1.000	1.000
fv_achiev1	1.000				1.000	1.000
fv_achiev2	1.000				1.000	1.000
fv_hedon1	1.000				1.000	1.000
fv_hedon2	1.000				1.000	1.000
fv_stim1	1.000				1.000	1.000
fv_stim2	1.000				1.000	1.000
fv_selfd1	1.000				1.000	1.000
fv_selfd2	1.000				1.000	1.000

C.2 Lavaan code and full summary of CFA fundamental values (four dimensions)

```
                                CFA_FV_dimens.txt
cfa_fv <- '
# latent variables
fv_selftr =~ fv_univ1 + fv_univ2 + fv_univ3 + fv_benev1 + fv_benev2
fv_selfenh =~ fv_achiev1 + fv_achiev2 + fv_power1 + fv_power2
fv_opc =~ fv_hedon1 + fv_hedon2 + fv_selfd1 + fv_selfd2
fv_cons =~ fv_secur1 + fv_secur2 + fv_trad1 + fv_trad2 + fv_conf1 + fv_conf2
'

fit <- cfa(cfa_fv, data=X170310_watervaluesR,
ordered=c("fv_univ1","fv_univ2","fv_univ3","fv_benev1","fv_benev2","fv_conf1","f
v_conf2","fv_trad1","fv_trad2","fv_secur1","fv_secur2","fv_power1","fv_power2","
fv_achiev1","fv_achiev2","fv_hedon1","fv_hedon2","fv_selfd1","fv_selfd2"))
summary(fit, fit.measures=TRUE, standardized=TRUE)

> summary(fit, fit.measures=TRUE, standardized=TRUE)
lavaan (0.5-23.1097) converged normally after  36 iterations

                                                  Used       Total
  Number of observations                          1053        1067

  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic               581.107     688.535
  Degrees of freedom                                146         146
  P-value (Chi-square)                            0.000       0.000
  Scaling correction factor                                   0.881
  Shift parameter                                            28.593
    for simple second-order correction (Mplus variant)

Model test baseline model:

  Minimum Function Test Statistic            14371.550    9002.430
  Degrees of freedom                               171         171
  P-value                                        0.000       0.000

User model versus baseline model:

  Comparative Fit Index (CFI)                    0.969       0.939
  Tucker-Lewis Index (TLI)                       0.964       0.928

  Robust Comparative Fit Index (CFI)                            NA
  Robust Tucker-Lewis Index (TLI)                               NA

Root Mean Square Error of Approximation:

  RMSEA                                          0.053       0.059
  90 Percent Confidence Interval          0.049  0.058       0.055  0.064
  P-value RMSEA <= 0.05                          0.118       0.000

  Robust RMSEA                                                  NA
  90 Percent Confidence Interval                                NA     NA

Standardized Root Mean Square Residual:

  SRMR                                           0.055       0.055

Weighted Root Mean Square Residual:

  WRMR                                           1.478       1.478

Parameter Estimates:

  Information                                 Expected
  Standard Errors                           Robust.sem

Latent Variables:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  fv_selftr =~
    fv_univ1          1.000                                0.565    0.565
                                    Page 1
```

CFA_FV_dimens.txt

fv_univ2	0.983	0.063	15.692	0.000	0.556	0.556
fv_univ3	1.282	0.070	18.357	0.000	0.725	0.725
fv_benev1	1.258	0.071	17.703	0.000	0.711	0.711
fv_benev2	1.256	0.070	17.875	0.000	0.710	0.710
fv_selfenh =~						
fv_achiev1	1.000				0.643	0.643
fv_achiev2	1.300	0.100	13.049	0.000	0.836	0.836
fv_power1	0.167	0.066	2.530	0.011	0.107	0.107
fv_power2	0.458	0.057	8.064	0.000	0.295	0.295
fv_opc =~						
fv_hedon1	1.000				0.643	0.643
fv_hedon2	0.783	0.056	14.102	0.000	0.504	0.504
fv_selfd1	0.755	0.057	13.267	0.000	0.486	0.486
fv_selfd2	0.560	0.056	10.080	0.000	0.360	0.360
fv_cons =~						
fv_secur1	1.000				0.608	0.608
fv_secur2	0.980	0.049	20.133	0.000	0.596	0.596
fv_trad1	1.166	0.053	22.177	0.000	0.709	0.709
fv_trad2	0.867	0.050	17.389	0.000	0.527	0.527
fv_conf1	0.524	0.051	10.272	0.000	0.318	0.318
fv_conf2	0.648	0.050	12.958	0.000	0.394	0.394

Covariances:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_selftr ~~						
fv_selfenh	0.105	0.015	6.882	0.000	0.288	0.288
fv_opc	0.268	0.020	13.501	0.000	0.736	0.736
fv_cons	0.317	0.021	14.935	0.000	0.924	0.924
fv_selfenh ~~						
fv_opc	0.263	0.023	11.435	0.000	0.635	0.635
fv_cons	0.170	0.018	9.353	0.000	0.435	0.435
fv_opc ~~						
fv_cons	0.259	0.019	13.509	0.000	0.661	0.661

Intercepts:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
.fv_univ1	0.000				0.000	0.000
.fv_univ2	0.000				0.000	0.000
.fv_univ3	0.000				0.000	0.000
.fv_benev1	0.000				0.000	0.000
.fv_benev2	0.000				0.000	0.000
.fv_achiev1	0.000				0.000	0.000
.fv_achiev2	0.000				0.000	0.000
.fv_power1	0.000				0.000	0.000
.fv_power2	0.000				0.000	0.000
.fv_hedon1	0.000				0.000	0.000
.fv_hedon2	0.000				0.000	0.000
.fv_selfd1	0.000				0.000	0.000
.fv_selfd2	0.000				0.000	0.000
.fv_secur1	0.000				0.000	0.000
.fv_secur2	0.000				0.000	0.000
.fv_trad1	0.000				0.000	0.000
.fv_trad2	0.000				0.000	0.000
.fv_conf1	0.000				0.000	0.000
.fv_conf2	0.000				0.000	0.000
fv_selftr	0.000				0.000	0.000
fv_selfenh	0.000				0.000	0.000
fv_opc	0.000				0.000	0.000
fv_cons	0.000				0.000	0.000

Thresholds:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ1|t1	-2.246	0.106	-21.121	0.000	-2.246	-2.246
fv_univ1|t2	-1.763	0.071	-24.923	0.000	-1.763	-1.763
fv_univ1|t3	-1.467	0.058	-25.168	0.000	-1.467	-1.467
fv_univ1|t4	-0.790	0.043	-18.228	0.000	-0.790	-0.790
fv_univ1|t5	-0.246	0.039	-6.308	0.000	-0.246	-0.246
fv_univ2|t1	-2.217	0.103	-21.433	0.000	-2.217	-2.217

CFA_FV_dimens.txt

fv_univ2|t2	-1.481	0.059	-25.200	0.000	-1.481	-1.481
fv_univ2|t3	-0.910	0.045	-20.198	0.000	-0.910	-0.910
fv_univ2|t4	-0.161	0.039	-4.157	0.000	-0.161	-0.161
fv_univ2|t5	0.387	0.040	9.739	0.000	0.387	0.387
fv_univ3|t1	-2.669	0.168	-15.921	0.000	-2.669	-2.669
fv_univ3|t2	-2.217	0.103	-21.433	0.000	-2.217	-2.217
fv_univ3|t3	-1.615	0.064	-25.282	0.000	-1.615	-1.615
fv_univ3|t4	-0.784	0.043	-18.113	0.000	-0.784	-0.784
fv_univ3|t5	-0.176	0.039	-4.526	0.000	-0.176	-0.176
fv_benev1|t1	-2.669	0.168	-15.921	0.000	-2.669	-2.669
fv_benev1|t2	-2.190	0.101	-21.719	0.000	-2.190	-2.190
fv_benev1|t3	-1.597	0.063	-25.294	0.000	-1.597	-1.597
fv_benev1|t4	-0.611	0.041	-14.762	0.000	-0.611	-0.611
fv_benev1|t5	0.037	0.039	0.955	0.340	0.037	0.037
fv_benev2|t1	-2.476	0.135	-18.398	0.000	-2.476	-2.476
fv_benev2|t2	-1.933	0.081	-23.988	0.000	-1.933	-1.933
fv_benev2|t3	-1.467	0.058	-25.168	0.000	-1.467	-1.467
fv_benev2|t4	-0.702	0.042	-16.600	0.000	-0.702	-0.702
fv_benev2|t5	-0.035	0.039	-0.893	0.372	-0.035	-0.035
fv_achiev1|t1	-1.460	0.058	-25.151	0.000	-1.460	-1.460
fv_achiev1|t2	-0.807	0.044	-18.515	0.000	-0.807	-0.807
fv_achiev1|t3	-0.291	0.039	-7.413	0.000	-0.291	-0.291
fv_achiev1|t4	0.303	0.039	7.720	0.000	0.303	0.303
fv_achiev1|t5	0.739	0.043	17.302	0.000	0.739	0.739
fv_achiev2|t1	-1.439	0.057	-25.093	0.000	-1.439	-1.439
fv_achiev2|t2	-0.840	0.044	-19.083	0.000	-0.840	-0.840
fv_achiev2|t3	-0.298	0.039	-7.597	0.000	-0.298	-0.298
fv_achiev2|t4	0.326	0.039	8.271	0.000	0.326	0.326
fv_achiev2|t5	0.755	0.043	17.593	0.000	0.755	0.755
fv_power1|t1	-0.147	0.039	-3.787	0.000	-0.147	-0.147
fv_power1|t2	0.871	0.044	19.589	0.000	0.871	0.871
fv_power1|t3	1.316	0.054	24.538	0.000	1.316	1.316
fv_power1|t4	1.763	0.071	24.923	0.000	1.763	1.763
fv_power1|t5	2.017	0.086	23.350	0.000	2.017	2.017
fv_power2|t1	-0.875	0.045	-19.645	0.000	-0.875	-0.875
fv_power2|t2	-0.128	0.039	-3.295	0.001	-0.128	-0.128
fv_power2|t3	0.283	0.039	7.229	0.000	0.283	0.283
fv_power2|t4	0.749	0.043	17.477	0.000	0.749	0.749
fv_power2|t5	1.158	0.050	23.298	0.000	1.158	1.158
fv_hedon1|t1	-1.889	0.078	-24.281	0.000	-1.889	-1.889
fv_hedon1|t2	-1.322	0.054	-24.572	0.000	-1.322	-1.322
fv_hedon1|t3	-0.837	0.044	-19.027	0.000	-0.837	-0.837
fv_hedon1|t4	-0.154	0.039	-3.972	0.000	-0.154	-0.154
fv_hedon1|t5	0.333	0.039	8.455	0.000	0.333	0.333
fv_hedon2|t1	-1.474	0.059	-25.185	0.000	-1.474	-1.474
fv_hedon2|t2	-0.840	0.044	-19.083	0.000	-0.840	-0.840
fv_hedon2|t3	-0.351	0.040	-8.883	0.000	-0.351	-0.351
fv_hedon2|t4	0.190	0.039	4.895	0.000	0.190	0.190
fv_hedon2|t5	0.588	0.041	14.283	0.000	0.588	0.588
fv_selfd1|t1	-1.633	0.065	-25.263	0.000	-1.633	-1.633
fv_selfd1|t2	-1.135	0.049	-23.069	0.000	-1.135	-1.135
fv_selfd1|t3	-0.454	0.040	-11.323	0.000	-0.454	-0.454
fv_selfd1|t4	0.242	0.039	6.185	0.000	0.242	0.242
fv_selfd1|t5	0.669	0.042	15.951	0.000	0.669	0.669
fv_selfd2|t1	-1.965	0.083	-23.758	0.000	-1.965	-1.965
fv_selfd2|t2	-1.300	0.053	-24.435	0.000	-1.300	-1.300
fv_selfd2|t3	-0.892	0.045	-19.922	0.000	-0.892	-0.892
fv_selfd2|t4	-0.291	0.039	-7.413	0.000	-0.291	-0.291
fv_selfd2|t5	0.142	0.039	3.664	0.000	0.142	0.142
fv_secur1|t1	-2.217	0.103	-21.433	0.000	-2.217	-2.217
fv_secur1|t2	-1.689	0.067	-25.158	0.000	-1.689	-1.689
fv_secur1|t3	-1.231	0.051	-23.941	0.000	-1.231	-1.231
fv_secur1|t4	-0.452	0.040	-11.262	0.000	-0.452	-0.452
fv_secur1|t5	0.109	0.039	2.802	0.005	0.109	0.109
fv_secur2|t1	-1.982	0.084	-23.631	0.000	-1.982	-1.982
fv_secur2|t2	-1.407	0.056	-24.979	0.000	-1.407	-1.407
fv_secur2|t3	-0.899	0.045	-20.033	0.000	-0.899	-0.899
fv_secur2|t4	-0.234	0.039	-6.001	0.000	-0.234	-0.234

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fv_secur2|t5	0.296	0.039	7.536	0.000	0.296	0.296
fv_trad1|t1	-2.246	0.106	-21.121	0.000	-2.246	-2.246
fv_trad1|t2	-1.798	0.073	-24.775	0.000	-1.798	-1.798
fv_trad1|t3	-1.300	0.053	-24.435	0.000	-1.300	-1.300
fv_trad1|t4	-0.400	0.040	-10.044	0.000	-0.400	-0.400
fv_trad1|t5	0.123	0.039	3.172	0.002	0.123	0.123
fv_trad2|t1	-1.848	0.075	-24.521	0.000	-1.848	-1.848
fv_trad2|t2	-1.334	0.054	-24.637	0.000	-1.334	-1.334
fv_trad2|t3	-0.844	0.044	-19.140	0.000	-0.844	-0.844
fv_trad2|t4	-0.210	0.039	-5.387	0.000	-0.210	-0.210
fv_trad2|t5	0.288	0.039	7.352	0.000	0.288	0.288
fv_conf1|t1	-1.121	0.049	-22.929	0.000	-1.121	-1.121
fv_conf1|t2	-0.511	0.041	-12.597	0.000	-0.511	-0.511
fv_conf1|t3	-0.178	0.039	-4.587	0.000	-0.178	-0.178
fv_conf1|t4	0.364	0.040	9.189	0.000	0.364	0.364
fv_conf1|t5	0.771	0.043	17.882	0.000	0.771	0.771
fv_conf2|t1	-1.460	0.058	-25.151	0.000	-1.460	-1.460
fv_conf2|t2	-0.794	0.043	-18.286	0.000	-0.794	-0.794
fv_conf2|t3	-0.288	0.039	-7.352	0.000	-0.288	-0.288
fv_conf2|t4	0.261	0.039	6.677	0.000	0.261	0.261
fv_conf2|t5	0.718	0.042	16.893	0.000	0.718	0.718

Variances:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
.fv_univ1	0.681				0.681	0.681
.fv_univ2	0.691				0.691	0.691
.fv_univ3	0.475				0.475	0.475
.fv_benev1	0.495				0.495	0.495
.fv_benev2	0.496				0.496	0.496
.fv_achiev1	0.586				0.586	0.586
.fv_achiev2	0.301				0.301	0.301
.fv_power1	0.988				0.988	0.988
.fv_power2	0.913				0.913	0.913
.fv_hedon1	0.586				0.586	0.586
.fv_hedon2	0.746				0.746	0.746
.fv_selfd1	0.764				0.764	0.764
.fv_selfd2	0.870				0.870	0.870
.fv_secur1	0.630				0.630	0.630
.fv_secur2	0.645				0.645	0.645
.fv_trad1	0.497				0.497	0.497
.fv_trad2	0.722				0.722	0.722
.fv_conf1	0.899				0.899	0.899
.fv_conf2	0.845				0.845	0.845
fv_selftr	0.319	0.031	10.182	0.000	1.000	1.000
fv_selfenh	0.414	0.039	10.647	0.000	1.000	1.000
fv_opc	0.414	0.038	10.798	0.000	1.000	1.000
fv_cons	0.370	0.028	13.000	0.000	1.000	1.000

Scales y*:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ1	1.000				1.000	1.000
fv_univ2	1.000				1.000	1.000
fv_univ3	1.000				1.000	1.000
fv_benev1	1.000				1.000	1.000
fv_benev2	1.000				1.000	1.000
fv_achiev1	1.000				1.000	1.000
fv_achiev2	1.000				1.000	1.000
fv_power1	1.000				1.000	1.000
fv_power2	1.000				1.000	1.000
fv_hedon1	1.000				1.000	1.000
fv_hedon2	1.000				1.000	1.000
fv_selfd1	1.000				1.000	1.000
fv_selfd2	1.000				1.000	1.000
fv_secur1	1.000				1.000	1.000
fv_secur2	1.000				1.000	1.000
fv_trad1	1.000				1.000	1.000
fv_trad2	1.000				1.000	1.000
fv_conf1	1.000				1.000	1.000

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fv_conf2	1.000		1.000	1.000

C.3 Lavaan code and full summary of CFA fundamental values (four dimensions) – final version

```
                                CFA_FV_dimens_final.txt
cfa_fv <- '
# latent variables
fv_selftr =~ fv_univ1 + fv_univ2 + fv_univ3 + fv_benev1 + fv_benev2
fv_selfenh =~ fv_achiev1 + fv_achiev2
fv_opc =~ fv_hedon1 + fv_hedon2 + fv_selfd1
fv_cons =~ fv_secur1 + fv_secur2 + fv_trad1 + fv_trad2
'

fit <- cfa(cfa_fv, data=X170310_watervaluesR,
ordered=c("fv_univ1","fv_univ2","fv_univ3","fv_benev1","fv_benev2","fv_trad1","f
v_trad2","fv_secur1","fv_secur2","fv_achiev1","fv_achiev2","fv_hedon1","fv_hedon
2","fv_selfd1"))
summary(fit, fit.measures=TRUE, standardized=TRUE)

> summary(fit, fit.measures=TRUE, standardized=TRUE)
lavaan (0.5-23.1097) converged normally after  35 iterations

                                                  Used       Total
  Number of observations                          1059        1067

  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic              178.588     256.725
  Degrees of freedom                               71          71
  P-value (Chi-square)                          0.000       0.000
  Scaling correction factor                                 0.722
  Shift parameter                                           9.476
    for simple second-order correction (Mplus variant)

Model test baseline model:

  Minimum Function Test Statistic            12315.592    7678.073
  Degrees of freedom                                91          91
  P-value                                        0.000       0.000

User model versus baseline model:

  Comparative Fit Index (CFI)                    0.991       0.976
  Tucker-Lewis Index (TLI)                       0.989       0.969

  Robust Comparative Fit Index (CFI)                            NA
  Robust Tucker-Lewis Index (TLI)                               NA

Root Mean Square Error of Approximation:

  RMSEA                                          0.038       0.050
  90 Percent Confidence Interval          0.031  0.045       0.043  0.056
  P-value RMSEA <= 0.05                          0.998       0.515

  Robust RMSEA                                                  NA
  90 Percent Confidence Interval                                NA     NA

Standardized Root Mean Square Residual:

  SRMR                                           0.037       0.037

Weighted Root Mean Square Residual:

  WRMR                                           1.053       1.053

Parameter Estimates:

  Information                                 Expected
  Standard Errors                           Robust.sem

Latent Variables:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  fv_selftr =~
    fv_univ1          1.000                                0.577    0.577
                                    Page 1
```

```
    fv_univ2          0.974    0.059   16.472    0.000    0.562    0.562
    fv_univ3          1.263    0.065   19.413    0.000    0.729    0.729
    fv_benev1         1.226    0.067   18.375    0.000    0.707    0.707
    fv_benev2         1.228    0.066   18.563    0.000    0.708    0.708
  fv_selfenh =~
    fv_achiev1        1.000                               0.647    0.647
    fv_achiev2        1.234    0.099   12.412    0.000    0.798    0.798
  fv_opc =~
    fv_hedon1         1.000                               0.647    0.647
    fv_hedon2         0.795    0.057   13.889    0.000    0.515    0.515
    fv_selfd1         0.739    0.057   12.997    0.000    0.478    0.478
  fv_cons =~
    fv_secur1         1.000                               0.587    0.587
    fv_secur2         0.976    0.049   20.039    0.000    0.573    0.573
    fv_trad1          1.171    0.054   21.575    0.000    0.688    0.688
    fv_trad2          0.870    0.052   16.807    0.000    0.511    0.511

Covariances:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  fv_selftr ~~
    fv_selfenh        0.125    0.017    7.546    0.000    0.335    0.335
    fv_opc            0.270    0.020   13.594    0.000    0.722    0.722
    fv_cons           0.326    0.021   15.291    0.000    0.962    0.962
  fv_selfenh ~~
    fv_opc            0.268    0.024   11.231    0.000    0.640    0.640
    fv_cons           0.183    0.019    9.574    0.000    0.482    0.482
  fv_opc ~~
    fv_cons           0.269    0.019   13.842    0.000    0.708    0.708

Intercepts:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
   .fv_univ1          0.000                               0.000    0.000
   .fv_univ2          0.000                               0.000    0.000
   .fv_univ3          0.000                               0.000    0.000
   .fv_benev1         0.000                               0.000    0.000
   .fv_benev2         0.000                               0.000    0.000
   .fv_achiev1        0.000                               0.000    0.000
   .fv_achiev2        0.000                               0.000    0.000
   .fv_hedon1         0.000                               0.000    0.000
   .fv_hedon2         0.000                               0.000    0.000
   .fv_selfd1         0.000                               0.000    0.000
   .fv_secur1         0.000                               0.000    0.000
   .fv_secur2         0.000                               0.000    0.000
   .fv_trad1          0.000                               0.000    0.000
   .fv_trad2          0.000                               0.000    0.000
    fv_selftr         0.000                               0.000    0.000
    fv_selfenh        0.000                               0.000    0.000
    fv_opc            0.000                               0.000    0.000
    fv_cons           0.000                               0.000    0.000

Thresholds:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
    fv_univ1|t1      -2.167    0.098  -22.021    0.000   -2.167   -2.167
    fv_univ1|t2      -1.733    0.069  -25.104    0.000   -1.733   -1.733
    fv_univ1|t3      -1.436    0.057  -25.153    0.000   -1.436   -1.436
    fv_univ1|t4      -0.779    0.043  -18.067    0.000   -0.779   -0.779
    fv_univ1|t5      -0.240    0.039   -6.168    0.000   -0.240   -0.240
    fv_univ2|t1      -2.220    0.103  -21.470    0.000   -2.220   -2.220
    fv_univ2|t2      -1.477    0.058  -25.263    0.000   -1.477   -1.477
    fv_univ2|t3      -0.903    0.045  -20.151    0.000   -0.903   -0.903
    fv_univ2|t4      -0.160    0.039   -4.145    0.000   -0.160   -0.160
    fv_univ2|t5       0.387    0.040    9.773    0.000    0.387    0.387
    fv_univ3|t1      -2.671    0.168  -15.941    0.000   -2.671   -2.671
    fv_univ3|t2      -2.193    0.101  -21.757    0.000   -2.193   -2.193
    fv_univ3|t3      -1.592    0.063  -25.368    0.000   -1.592   -1.592
    fv_univ3|t4      -0.779    0.043  -18.067    0.000   -0.779   -0.779
    fv_univ3|t5      -0.170    0.039   -4.390    0.000   -0.170   -0.170
    fv_benev1|t1     -2.671    0.168  -15.941    0.000   -2.671   -2.671
```

CFA_FV_dimens_final.txt

fv_benev1|t2	-2.193	0.101	-21.757	0.000	-2.193	-2.193
fv_benev1|t3	-1.592	0.063	-25.368	0.000	-1.592	-1.592
fv_benev1|t4	-0.601	0.041	-14.603	0.000	-0.601	-0.601
fv_benev1|t5	0.044	0.039	1.136	0.256	0.044	0.044
fv_benev2|t1	-2.478	0.134	-18.425	0.000	-2.478	-2.478
fv_benev2|t2	-1.936	0.081	-24.039	0.000	-1.936	-1.936
fv_benev2|t3	-1.463	0.058	-25.230	0.000	-1.463	-1.463
fv_benev2|t4	-0.698	0.042	-16.556	0.000	-0.698	-0.698
fv_benev2|t5	-0.030	0.039	-0.768	0.443	-0.030	-0.030
fv_achiev1|t1	-1.456	0.058	-25.212	0.000	-1.456	-1.456
fv_achiev1|t2	-0.804	0.043	-18.525	0.000	-0.804	-0.804
fv_achiev1|t3	-0.289	0.039	-7.392	0.000	-0.289	-0.289
fv_achiev1|t4	0.307	0.039	7.820	0.000	0.307	0.307
fv_achiev1|t5	0.741	0.043	17.373	0.000	0.741	0.741
fv_achiev2|t1	-1.442	0.057	-25.173	0.000	-1.442	-1.442
fv_achiev2|t2	-0.838	0.044	-19.092	0.000	-0.838	-0.838
fv_achiev2|t3	-0.297	0.039	-7.576	0.000	-0.297	-0.297
fv_achiev2|t4	0.329	0.039	8.370	0.000	0.329	0.329
fv_achiev2|t5	0.756	0.043	17.663	0.000	0.756	0.756
fv_hedon1|t1	-1.892	0.078	-24.334	0.000	-1.892	-1.892
fv_hedon1|t2	-1.325	0.054	-24.660	0.000	-1.325	-1.325
fv_hedon1|t3	-0.831	0.044	-18.980	0.000	-0.831	-0.831
fv_hedon1|t4	-0.151	0.039	-3.899	0.000	-0.151	-0.151
fv_hedon1|t5	0.336	0.039	8.553	0.000	0.336	0.336
fv_hedon2|t1	-1.477	0.058	-25.263	0.000	-1.477	-1.477
fv_hedon2|t2	-0.841	0.044	-19.149	0.000	-0.841	-0.841
fv_hedon2|t3	-0.346	0.039	-8.797	0.000	-0.346	-0.346
fv_hedon2|t4	0.194	0.039	5.004	0.000	0.194	0.194
fv_hedon2|t5	0.590	0.041	14.364	0.000	0.590	0.590
fv_selfd1|t1	-1.635	0.065	-25.332	0.000	-1.635	-1.635
fv_selfd1|t2	-1.129	0.049	-23.078	0.000	-1.129	-1.129
fv_selfd1|t3	-0.452	0.040	-11.292	0.000	-0.452	-0.452
fv_selfd1|t4	0.243	0.039	6.229	0.000	0.243	0.243
fv_selfd1|t5	0.668	0.042	15.968	0.000	0.668	0.668
fv_secur1|t1	-2.220	0.103	-21.470	0.000	-2.220	-2.220
fv_secur1|t2	-1.692	0.067	-25.223	0.000	-1.692	-1.692
fv_secur1|t3	-1.234	0.051	-24.036	0.000	-1.234	-1.234
fv_secur1|t4	-0.454	0.040	-11.352	0.000	-0.454	-0.454
fv_secur1|t5	0.108	0.039	2.795	0.005	0.108	0.108
fv_secur2|t1	-1.984	0.084	-23.680	0.000	-1.984	-1.984
fv_secur2|t2	-1.410	0.056	-25.062	0.000	-1.410	-1.410
fv_secur2|t3	-0.903	0.045	-20.151	0.000	-0.903	-0.903
fv_secur2|t4	-0.238	0.039	-6.107	0.000	-0.238	-0.238
fv_secur2|t5	0.297	0.039	7.576	0.000	0.297	0.297
fv_trad1|t1	-2.248	0.106	-21.157	0.000	-2.248	-2.248
fv_trad1|t2	-1.801	0.073	-24.833	0.000	-1.801	-1.801
fv_trad1|t3	-1.292	0.053	-24.454	0.000	-1.292	-1.292
fv_trad1|t4	-0.397	0.040	-10.016	0.000	-0.397	-0.397
fv_trad1|t5	0.122	0.039	3.163	0.002	0.122	0.122
fv_trad2|t1	-1.838	0.075	-24.648	0.000	-1.838	-1.838
fv_trad2|t2	-1.325	0.054	-24.660	0.000	-1.325	-1.325
fv_trad2|t3	-0.838	0.044	-19.092	0.000	-0.838	-0.838
fv_trad2|t4	-0.204	0.039	-5.249	0.000	-0.204	-0.204
fv_trad2|t5	0.294	0.039	7.514	0.000	0.294	0.294

Variances:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
.fv_univ1	0.667				0.667	0.667
.fv_univ2	0.684				0.684	0.684
.fv_univ3	0.469				0.469	0.469
.fv_benev1	0.499				0.499	0.499
.fv_benev2	0.498				0.498	0.498
.fv_achiev1	0.582				0.582	0.582
.fv_achiev2	0.363				0.363	0.363
.fv_hedon1	0.581				0.581	0.581
.fv_hedon2	0.735				0.735	0.735
.fv_selfd1	0.771				0.771	0.771
.fv_secur1	0.655				0.655	0.655

CFA_FV_dimens_final.txt

.fv_secur2	0.671				0.671	0.671
.fv_trad1	0.527				0.527	0.527
.fv_trad2	0.739				0.739	0.739
fv_selftr	0.333	0.031	10.605	0.000	1.000	1.000
fv_selfenh	0.418	0.039	10.637	0.000	1.000	1.000
fv_opc	0.419	0.039	10.755	0.000	1.000	1.000
fv_cons	0.345	0.027	12.599	0.000	1.000	1.000

Scales y*:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ1	1.000				1.000	1.000
fv_univ2	1.000				1.000	1.000
fv_univ3	1.000				1.000	1.000
fv_benev1	1.000				1.000	1.000
fv_benev2	1.000				1.000	1.000
fv_achiev1	1.000				1.000	1.000
fv_achiev2	1.000				1.000	1.000
fv_hedon1	1.000				1.000	1.000
fv_hedon2	1.000				1.000	1.000
fv_selfd1	1.000				1.000	1.000
fv_secur1	1.000				1.000	1.000
fv_secur2	1.000				1.000	1.000
fv_trad1	1.000				1.000	1.000
fv_trad2	1.000				1.000	1.000

C.4 Lavaan code and full summary of CFA governance-related values

CFA_GV.txt

```
cfa_gv <- '
# latent variables
gv_democ =~ gv_democ1 + gv_democ2
gv_econ =~ gv_econ1 + gv_econ2
gv_sci =~ gv_sci1 + gv_sci2
'

fit <- cfa(cfa_gv, data=X170310_watervaluesR,
ordered=c("gv_democ1","gv_democ2","gv_econ1","gv_econ2","gv_sci1","gv_sci2"))
summary(fit, fit.measures=TRUE, standardized=TRUE)

> summary(fit, fit.measures=TRUE, standardized=TRUE)
lavaan (0.5-23.1097) converged normally after  34 iterations

                                                  Used       Total
  Number of observations                          1055        1067

  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic                6.480       8.552
  Degrees of freedom                                 6           6
  P-value (Chi-square)                           0.372       0.200
  Scaling correction factor                                  0.765
  Shift parameter                                            0.077
    for simple second-order correction (Mplus variant)

Model test baseline model:

  Minimum Function Test Statistic              396.178     373.477
  Degrees of freedom                                15          15
  P-value                                        0.000       0.000

User model versus baseline model:

  Comparative Fit Index (CFI)                    0.999       0.993
  Tucker-Lewis Index (TLI)                       0.997       0.982

  Robust Comparative Fit Index (CFI)                            NA
  Robust Tucker-Lewis Index (TLI)                               NA

Root Mean Square Error of Approximation:

  RMSEA                                          0.009       0.020
  90 Percent Confidence Interval          0.000  0.042       0.000  0.048
  P-value RMSEA <= 0.05                          0.987       0.964

  Robust RMSEA                                                  NA
  90 Percent Confidence Interval                             0.000     NA

Standardized Root Mean Square Residual:

  SRMR                                           0.032       0.032

Weighted Root Mean Square Residual:

  WRMR                                           0.408       0.408

Parameter Estimates:

  Information                                 Expected
  Standard Errors                           Robust.sem

Latent Variables:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  gv_democ =~
    gv_democ1         1.000                               0.561    0.561
    gv_democ2         1.263    0.202    6.242    0.000    0.709    0.709
  gv_econ =~
    gv_econ1          1.000                               0.584    0.584
```

```
                                CFA_GV.txt
    gv_econ2          0.891    0.135    6.590    0.000    0.520    0.520
  gv_sci =~
    gv_sci1           1.000                              0.475    0.475
    gv_sci2           1.260    0.338    3.725    0.000    0.598    0.598

Covariances:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  gv_democ ~~
    gv_econ           0.244    0.039    6.226    0.000    0.744    0.744
    gv_sci            0.123    0.033    3.741    0.000    0.463    0.463
  gv_econ ~~
    gv_sci            0.165    0.044    3.739    0.000    0.596    0.596

Intercepts:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
   .gv_democ1         0.000                              0.000    0.000
   .gv_democ2         0.000                              0.000    0.000
   .gv_econ1          0.000                              0.000    0.000
   .gv_econ2          0.000                              0.000    0.000
   .gv_sci1           0.000                              0.000    0.000
   .gv_sci2           0.000                              0.000    0.000
    gv_democ          0.000                              0.000    0.000
    gv_econ           0.000                              0.000    0.000
    gv_sci            0.000                              0.000    0.000

Thresholds:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
    gv_democ1|t1     -1.700    0.068  -25.155    0.000   -1.700   -1.700
    gv_democ1|t2     -1.370    0.055  -24.848    0.000   -1.370   -1.370
    gv_democ1|t3     -0.633    0.042  -15.225    0.000   -0.633   -0.633
    gv_democ1|t4      0.039    0.039    1.015    0.310    0.039    0.039
    gv_democ2|t1     -2.385    0.122  -19.529    0.000   -2.385   -2.385
    gv_democ2|t2     -2.076    0.091  -22.863    0.000   -2.076   -2.076
    gv_democ2|t3     -1.565    0.062  -25.322    0.000   -1.565   -1.565
    gv_democ2|t4     -0.757    0.043  -17.636    0.000   -0.757   -0.757
    gv_econ1|t1      -2.428    0.128  -19.004    0.000   -2.428   -2.428
    gv_econ1|t2      -2.119    0.094  -22.462    0.000   -2.119   -2.119
    gv_econ1|t3      -1.690    0.067  -25.180    0.000   -1.690   -1.690
    gv_econ1|t4      -1.009    0.047  -21.625    0.000   -1.009   -1.009
    gv_econ2|t1      -2.018    0.086  -23.365    0.000   -2.018   -2.018
    gv_econ2|t2      -1.721    0.069  -25.096    0.000   -1.721   -1.721
    gv_econ2|t3      -1.340    0.054  -24.698    0.000   -1.340   -1.340
    gv_econ2|t4      -0.845    0.044  -19.180    0.000   -0.845   -0.845
    gv_sci1|t1       -2.670    0.168  -15.927    0.000   -2.670   -2.670
    gv_sci1|t2       -2.278    0.110  -20.790    0.000   -2.278   -2.278
    gv_sci1|t3       -1.753    0.070  -24.986    0.000   -1.753   -1.753
    gv_sci1|t4       -1.062    0.048  -22.286    0.000   -1.062   -1.062
    gv_sci2|t1       -2.142    0.096  -22.237    0.000   -2.142   -2.142
    gv_sci2|t2       -1.787    0.072  -24.848    0.000   -1.787   -1.787
    gv_sci2|t3       -1.066    0.048  -22.335    0.000   -1.066   -1.066
    gv_sci2|t4       -0.283    0.039   -7.222    0.000   -0.283   -0.283

Variances:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
   .gv_democ1         0.685                              0.685    0.685
   .gv_democ2         0.498                              0.498    0.498
   .gv_econ1          0.659                              0.659    0.659
   .gv_econ2          0.729                              0.729    0.729
   .gv_sci1           0.774                              0.774    0.774
   .gv_sci2           0.642                              0.642    0.642
    gv_democ          0.315    0.061    5.141    0.000    1.000    1.000
    gv_econ           0.341    0.080    4.243    0.000    1.000    1.000
    gv_sci            0.226    0.073    3.112    0.002    1.000    1.000

Scales y*:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
    gv_democ1         1.000                              1.000    1.000
    gv_democ2         1.000                              1.000    1.000
                                Page 2
```

CFA_GV.txt

gv_econ1	1.000		1.000	1.000
gv_econ2	1.000		1.000	1.000
gv_sci1	1.000		1.000	1.000
gv_sci2	1.000		1.000	1.000

C.5 Lavaan code and full summary of CFA assigned values

CFA_AS.txt

```
cfa_as <- '
# latent variables
as_cult =~ as_cult1 + as_cult2
as_econ =~ as_econ1 + as_econ2
as_ecol =~ as_ecol1 + as_ecol2
'

fit <- cfa(cfa_as, data=X170310_watervaluesR,
ordered=c("as_cult1","as_cult2","as_econ1","as_econ2","as_ecol1","as_ecol2"))
summary(fit, fit.measures=TRUE, standardized=TRUE)

> summary(fit, fit.measures=TRUE, standardized=TRUE)
lavaan (0.5-23.1097) converged normally after  29 iterations

                                                  Used       Total
  Number of observations                          1057        1067

  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic                4.245       5.878
  Degrees of freedom                                 6           6
  P-value (Chi-square)                           0.644       0.437
  Scaling correction factor                                  0.757
  Shift parameter                                            0.268
    for simple second-order correction (Mplus variant)

Model test baseline model:

  Minimum Function Test Statistic              755.480     686.041
  Degrees of freedom                                15          15
  P-value                                        0.000       0.000

User model versus baseline model:

  Comparative Fit Index (CFI)                    1.000       1.000
  Tucker-Lewis Index (TLI)                       1.006       1.000

  Robust Comparative Fit Index (CFI)                            NA
  Robust Tucker-Lewis Index (TLI)                               NA

Root Mean Square Error of Approximation:

  RMSEA                                          0.000       0.000
  90 Percent Confidence Interval          0.000  0.033       0.000  0.040
  P-value RMSEA <= 0.05                          0.997       0.991

  Robust RMSEA                                                  NA
  90 Percent Confidence Interval                             0.000     NA

Standardized Root Mean Square Residual:

  SRMR                                           0.026       0.026

Weighted Root Mean Square Residual:

  WRMR                                           0.330       0.330

Parameter Estimates:

  Information                                 Expected
  Standard Errors                           Robust.sem

Latent Variables:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  as_cult =~
    as_cult1          1.000                               0.664    0.664
    as_cult2          0.986    0.106    9.261    0.000    0.654    0.654
  as_econ =~
    as_econ1          1.000                               0.749    0.749
```

CFA_AS.txt

as_econ2	0.615	0.120	5.143	0.000	0.461	0.461
as_ecol =~						
as_ecol1	1.000				0.850	0.850
as_ecol2	0.770	0.140	5.481	0.000	0.654	0.654

Covariances:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
as_cult ~~						
as_econ	0.282	0.034	8.225	0.000	0.568	0.568
as_ecol	0.297	0.042	7.105	0.000	0.526	0.526
as_econ ~~						
as_ecol	0.148	0.043	3.435	0.001	0.232	0.232

Intercepts:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
.as_cult1	0.000				0.000	0.000
.as_cult2	0.000				0.000	0.000
.as_econ1	0.000				0.000	0.000
.as_econ2	0.000				0.000	0.000
.as_ecol1	0.000				0.000	0.000
.as_ecol2	0.000				0.000	0.000
as_cult	0.000				0.000	0.000
as_econ	0.000				0.000	0.000
as_ecol	0.000				0.000	0.000

Thresholds:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
as_cult1|t1	-1.812	0.073	-24.756	0.000	-1.812	-1.812
as_cult1|t2	-1.291	0.053	-24.424	0.000	-1.291	-1.291
as_cult1|t3	-0.603	0.041	-14.616	0.000	-0.603	-0.603
as_cult1|t4	0.011	0.039	0.277	0.782	0.011	0.011
as_cult2|t1	-1.490	0.059	-25.266	0.000	-1.490	-1.490
as_cult2|t2	-0.934	0.045	-20.602	0.000	-0.934	-0.934
as_cult2|t3	-0.233	0.039	-5.990	0.000	-0.233	-0.233
as_cult2|t4	0.347	0.039	8.805	0.000	0.347	0.347
as_econ1|t1	-2.166	0.098	-22.008	0.000	-2.166	-2.166
as_econ1|t2	-1.732	0.069	-25.083	0.000	-1.732	-1.732
as_econ1|t3	-1.089	0.048	-22.616	0.000	-1.089	-1.089
as_econ1|t4	-0.370	0.040	-9.355	0.000	-0.370	-0.370
as_econ2|t1	-1.920	0.080	-24.127	0.000	-1.920	-1.920
as_econ2|t2	-1.512	0.060	-25.303	0.000	-1.512	-1.512
as_econ2|t3	-1.072	0.048	-22.420	0.000	-1.072	-1.072
as_econ2|t4	-0.458	0.040	-11.423	0.000	-0.458	-0.458
as_ecol1|t1	-3.107	0.296	-10.508	0.000	-3.107	-3.107
as_ecol1|t2	-2.477	0.135	-18.416	0.000	-2.477	-2.477
as_ecol1|t3	-1.824	0.074	-24.695	0.000	-1.824	-1.824
as_ecol1|t4	-0.991	0.046	-21.402	0.000	-0.991	-0.991
as_ecol2|t1	-2.671	0.168	-15.934	0.000	-2.671	-2.671
as_ecol2|t2	-2.278	0.110	-20.802	0.000	-2.278	-2.278
as_ecol2|t3	-1.800	0.073	-24.814	0.000	-1.800	-1.800
as_ecol2|t4	-1.198	0.051	-23.714	0.000	-1.198	-1.198

Variances:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
.as_cult1	0.560				0.560	0.560
.as_cult2	0.572				0.572	0.572
.as_econ1	0.440				0.440	0.440
.as_econ2	0.788				0.788	0.788
.as_ecol1	0.278				0.278	0.278
.as_ecol2	0.572				0.572	0.572
as_cult	0.440	0.058	7.547	0.000	1.000	1.000
as_econ	0.560	0.117	4.773	0.000	1.000	1.000
as_ecol	0.722	0.139	5.213	0.000	1.000	1.000

Scales y*:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
as_cult1	1.000				1.000	1.000
as_cult2	1.000				1.000	1.000

CFA_AS.txt

as_econ1	1.000		1.000	1.000
as_econ2	1.000		1.000	1.000
as_ecol1	1.000		1.000	1.000
as_ecol2	1.000		1.000	1.000

C.6 Lavaan code and full summary of initial full structural equation model of value landscapes and their effect on preferences in water governance

watervalues_V1.txt

```
watervalues <- '
# latent variables
fv_selftr =~ fv_univ1 + fv_univ2 + fv_univ3 + fv_benev1 + fv_benev2
fv_selfenh =~ fv_achiev1 + fv_achiev2
fv_opc =~ fv_hedon1 + fv_hedon2 + fv_selfd1
fv_cons =~ fv_secur1 + fv_secur2 + fv_trad1 + fv_trad2
gv_democ =~ gv_democ1 + gv_democ2
gv_econ =~ gv_econ1 + gv_econ2
gv_sci =~ gv_sci1 + gv_sci2
as_cult =~ as_cult1 + as_cult2
as_ecol =~ as_ecol1 + as_ecol2
as_econ =~ as_econ1 + as_econ2
# regressions
gv_democ ~ fv_selftr + fv_selfenh
gv_econ ~ fv_selfenh
gv_sci ~ fv_selftr + fv_cons
as_ecol ~ fv_selftr + fv_opc + gv_sci
as_econ ~ fv_selfenh + gv_econ
as_cult ~ fv_cons + gv_democ
hidrov_ref ~ fv_selftr + fv_selfenh + fv_cons + fv_opc + gv_democ + gv_econ +
gv_sci + as_cult + as_ecol + as_econ
'


fit <- sem(watervalues, data=X170310_watervaluesR,
ordered=c("fv_univ1","fv_univ2","fv_univ3","fv_benev1","fv_benev2","fv_achiev1",
"fv_achiev2","fv_hedon1","fv_hedon2","fv_selfd1","fv_secur1","fv_secur2","fv_tra
d1","fv_trad2","gv_democ1","gv_democ2","gv_econ1","gv_econ2","gv_sci1","gv_sci2"
,"as_cult1","as_cult2","as_ecol1","as_ecol2","as_econ1","as_econ2","hidrov_ref")
)
summary(fit, fit.measures=TRUE, standardized=TRUE)
```

```
> summary(fit, fit.measures=TRUE, standardized=TRUE)
lavaan (0.5-23.1097) converged normally after 289 iterations

                                                  Used       Total
  Number of observations                          1025        1067

  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic              1078.042    1099.929
  Degrees of freedom                            296         296
  P-value (Chi-square)                            0.000       0.000
  Scaling correction factor                                   1.057
  Shift parameter                                            80.399
    for simple second-order correction (Mplus variant)

Model test baseline model:

  Minimum Function Test Statistic            14410.800    8729.140
  Degrees of freedom                           351         351
  P-value                                         0.000       0.000

User model versus baseline model:

  Comparative Fit Index (CFI)                     0.944       0.904
  Tucker-Lewis Index (TLI)                        0.934       0.886

  Robust Comparative Fit Index (CFI)                             NA
  Robust Tucker-Lewis Index (TLI)                                NA

Root Mean Square Error of Approximation:

  RMSEA                                           0.051       0.052
  90 Percent Confidence Interval          0.048   0.054       0.048   0.055
  P-value RMSEA <= 0.05                           0.339       0.220

  Robust RMSEA                                                   NA
  90 Percent Confidence Interval                                 NA     NA
```

```
                                watervalues_V1.txt
Standardized Root Mean Square Residual:

  SRMR                                           0.071       0.071

Weighted Root Mean Square Residual:

  WRMR                                           1.514       1.514

Parameter Estimates:

  Information                                 Expected
  Standard Errors                           Robust.sem

Latent Variables:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  fv_selftr =~
    fv_univ1          1.000                               0.566    0.566
    fv_univ2          0.990    0.063   15.763    0.000    0.560    0.560
    fv_univ3          1.276    0.068   18.654    0.000    0.722    0.722
    fv_benev1         1.222    0.070   17.441    0.000    0.692    0.692
    fv_benev2         1.209    0.069   17.507    0.000    0.684    0.684
  fv_selfenh =~
    fv_achiev1        1.000                               0.615    0.615
    fv_achiev2        1.187    0.096   12.383    0.000    0.730    0.730
  fv_opc =~
    fv_hedon1         1.000                               0.638    0.638
    fv_hedon2         0.841    0.063   13.453    0.000    0.537    0.537
    fv_selfd1         0.754    0.061   12.399    0.000    0.481    0.481
  fv_cons =~
    fv_secur1         1.000                               0.572    0.572
    fv_secur2         0.993    0.052   19.132    0.000    0.569    0.569
    fv_trad1          1.201    0.058   20.753    0.000    0.687    0.687
    fv_trad2          0.895    0.056   15.977    0.000    0.512    0.512
  gv_democ =~
    gv_democ1         1.000                               0.602    0.602
    gv_democ2         1.063    0.131    8.143    0.000    0.640    0.640
  gv_econ =~
    gv_econ1          1.000                               0.633    0.633
    gv_econ2          0.767    0.170    4.499    0.000    0.485    0.485
  gv_sci =~
    gv_sci1           1.000                               0.477    0.477
    gv_sci2           0.901    0.149    6.053    0.000    0.430    0.430
  as_cult =~
    as_cult1          1.000                               0.658    0.658
    as_cult2          1.011    0.113    8.957    0.000    0.665    0.665
  as_ecol =~
    as_ecol1          1.000                               0.719    0.719
    as_ecol2          1.085    0.134    8.111    0.000    0.780    0.780
  as_econ =~
    as_econ1          1.000                               0.550    0.550
    as_econ2          1.159    0.328    3.531    0.000    0.637    0.637

Regressions:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  gv_democ ~
    fv_selftr         0.193    0.067    2.883    0.004    0.181    0.181
    fv_selfenh        0.365    0.068    5.399    0.000    0.373    0.373
  gv_econ ~
    fv_selfenh        0.443    0.096    4.625    0.000    0.430    0.430
  gv_sci ~
    fv_selftr       -15.325   12.790   -1.198    0.231  -18.186  -18.186
    fv_cons          15.422   12.664    1.218    0.223   18.507   18.507
  as_ecol ~
    fv_selftr         0.224    0.175    1.275    0.202    0.176    0.176
    fv_opc           -0.148    0.166   -0.896    0.370   -0.132   -0.132
    gv_sci            1.187    0.206    5.764    0.000    0.788    0.788
  as_econ ~
    fv_selfenh        0.056    0.086    0.644    0.519    0.062    0.062
                                Page 2
```

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```
    gv_econ           0.403    0.161    2.500    0.012    0.464    0.464
  as_cult ~
    fv_cons          -4.899    1.765   -2.775    0.006   -4.259   -4.259
    gv_democ          0.773    0.134    5.787    0.000    0.707    0.707
    fv_selftr         4.776    1.792    2.666    0.008    4.106    4.106
  hidrov_ref ~
    fv_selftr        -2.270    1.388   -1.636    0.102   -1.285   -1.285
    fv_selfenh        0.242    0.289    0.839    0.401    0.149    0.149
    fv_cons           2.107    1.324    1.591    0.112    1.206    1.206
    fv_opc            0.232    0.278    0.832    0.405    0.148    0.148
    gv_democ         -0.391    0.344   -1.137    0.255   -0.236   -0.236
    gv_econ          -0.406    0.226   -1.794    0.073   -0.257   -0.257
    gv_sci           -0.602    0.697   -0.864    0.387   -0.287   -0.287
    as_cult           0.247    0.385    0.641    0.521    0.163    0.163
    as_ecol           0.152    0.397    0.383    0.701    0.109    0.109
    as_econ           0.259    0.180    1.436    0.151    0.142    0.142

Covariances:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  fv_selftr ~~
    fv_selfenh        0.145    0.017    8.726    0.000    0.416    0.416
    fv_opc            0.256    0.019   13.173    0.000    0.709    0.709
    fv_cons           0.325    0.022   14.779    0.000    1.004    1.004
  fv_selfenh ~~
    fv_opc            0.257    0.023   11.298    0.000    0.654    0.654
    fv_cons           0.151    0.016    9.274    0.000    0.428    0.428
  fv_opc ~~
    fv_cons           0.259    0.019   13.920    0.000    0.709    0.709

Intercepts:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
   .fv_univ1          0.000                              0.000    0.000
   .fv_univ2          0.000                              0.000    0.000
   .fv_univ3          0.000                              0.000    0.000
   .fv_benev1         0.000                              0.000    0.000
   .fv_benev2         0.000                              0.000    0.000
   .fv_achiev1        0.000                              0.000    0.000
   .fv_achiev2        0.000                              0.000    0.000
   .fv_hedon1         0.000                              0.000    0.000
   .fv_hedon2         0.000                              0.000    0.000
   .fv_selfd1         0.000                              0.000    0.000
   .fv_secur1         0.000                              0.000    0.000
   .fv_secur2         0.000                              0.000    0.000
   .fv_trad1          0.000                              0.000    0.000
   .fv_trad2          0.000                              0.000    0.000
   .gv_democ1         0.000                              0.000    0.000
   .gv_democ2         0.000                              0.000    0.000
   .gv_econ1          0.000                              0.000    0.000
   .gv_econ2          0.000                              0.000    0.000
   .gv_sci1           0.000                              0.000    0.000
   .gv_sci2           0.000                              0.000    0.000
   .as_cult1          0.000                              0.000    0.000
   .as_cult2          0.000                              0.000    0.000
   .as_ecol1          0.000                              0.000    0.000
   .as_ecol2          0.000                              0.000    0.000
   .as_econ1          0.000                              0.000    0.000
   .as_econ2          0.000                              0.000    0.000
   .hidrov_ref        0.000                              0.000    0.000
    fv_selftr         0.000                              0.000    0.000
    fv_selfenh        0.000                              0.000    0.000
    fv_opc            0.000                              0.000    0.000
    fv_cons           0.000                              0.000    0.000
   .gv_democ          0.000                              0.000    0.000
   .gv_econ           0.000                              0.000    0.000
   .gv_sci            0.000                              0.000    0.000
   .as_cult           0.000                              0.000    0.000
   .as_ecol           0.000                              0.000    0.000
   .as_econ           0.000                              0.000    0.000
```

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Thresholds:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ1|t1	-2.180	0.101	-21.536	0.000	-2.180	-2.180
fv_univ1|t2	-1.762	0.072	-24.593	0.000	-1.762	-1.762
fv_univ1|t3	-1.460	0.059	-24.813	0.000	-1.460	-1.460
fv_univ1|t4	-0.804	0.044	-18.216	0.000	-0.804	-0.804
fv_univ1|t5	-0.256	0.040	-6.456	0.000	-0.256	-0.256
fv_univ2|t1	-2.207	0.104	-21.256	0.000	-2.207	-2.207
fv_univ2|t2	-1.496	0.060	-24.892	0.000	-1.496	-1.496
fv_univ2|t3	-0.902	0.046	-19.811	0.000	-0.902	-0.902
fv_univ2|t4	-0.173	0.039	-4.400	0.000	-0.173	-0.173
fv_univ2|t5	0.374	0.040	9.312	0.000	0.374	0.374
fv_univ3|t1	-2.660	0.168	-15.823	0.000	-2.660	-2.660
fv_univ3|t2	-2.180	0.101	-21.536	0.000	-2.180	-2.180
fv_univ3|t3	-1.593	0.064	-24.957	0.000	-1.593	-1.593
fv_univ3|t4	-0.787	0.044	-17.925	0.000	-0.787	-0.787
fv_univ3|t5	-0.181	0.039	-4.587	0.000	-0.181	-0.181
fv_benev1|t1	-2.660	0.168	-15.823	0.000	-2.660	-2.660
fv_benev1|t2	-2.180	0.101	-21.536	0.000	-2.180	-2.180
fv_benev1|t3	-1.593	0.064	-24.957	0.000	-1.593	-1.593
fv_benev1|t4	-0.597	0.042	-14.287	0.000	-0.597	-0.597
fv_benev1|t5	0.033	0.039	0.843	0.399	0.033	0.033
fv_benev2|t1	-2.466	0.135	-18.270	0.000	-2.466	-2.466
fv_benev2|t2	-1.954	0.083	-23.524	0.000	-1.954	-1.954
fv_benev2|t3	-1.496	0.060	-24.892	0.000	-1.496	-1.496
fv_benev2|t4	-0.713	0.043	-16.571	0.000	-0.713	-0.713
fv_benev2|t5	-0.038	0.039	-0.968	0.333	-0.038	-0.038
fv_achiev1|t1	-1.467	0.059	-24.831	0.000	-1.467	-1.467
fv_achiev1|t2	-0.817	0.044	-18.447	0.000	-0.817	-0.817
fv_achiev1|t3	-0.299	0.040	-7.513	0.000	-0.299	-0.299
fv_achiev1|t4	0.302	0.040	7.575	0.000	0.302	0.302
fv_achiev1|t5	0.735	0.043	16.986	0.000	0.735	0.735
fv_achiev2|t1	-1.446	0.058	-24.775	0.000	-1.446	-1.446
fv_achiev2|t2	-0.852	0.045	-19.021	0.000	-0.852	-0.852
fv_achiev2|t3	-0.299	0.040	-7.513	0.000	-0.299	-0.299
fv_achiev2|t4	0.325	0.040	8.134	0.000	0.325	0.325
fv_achiev2|t5	0.744	0.043	17.163	0.000	0.744	0.744
fv_hedon1|t1	-1.892	0.079	-23.940	0.000	-1.892	-1.892
fv_hedon1|t2	-1.336	0.055	-24.321	0.000	-1.336	-1.336
fv_hedon1|t3	-0.835	0.045	-18.735	0.000	-0.835	-0.835
fv_hedon1|t4	-0.156	0.039	-3.963	0.000	-0.156	-0.156
fv_hedon1|t5	0.327	0.040	8.196	0.000	0.327	0.327
fv_hedon2|t1	-1.474	0.059	-24.848	0.000	-1.474	-1.474
fv_hedon2|t2	-0.849	0.045	-18.964	0.000	-0.849	-0.849
fv_hedon2|t3	-0.364	0.040	-9.064	0.000	-0.364	-0.364
fv_hedon2|t4	0.178	0.039	4.525	0.000	0.178	0.178
fv_hedon2|t5	0.577	0.042	13.861	0.000	0.577	0.577
fv_selfd1|t1	-1.657	0.067	-24.889	0.000	-1.657	-1.657
fv_selfd1|t2	-1.146	0.050	-22.872	0.000	-1.146	-1.146
fv_selfd1|t3	-0.451	0.041	-11.104	0.000	-0.451	-0.451
fv_selfd1|t4	0.238	0.040	6.020	0.000	0.238	0.238
fv_selfd1|t5	0.657	0.042	15.495	0.000	0.657	0.657
fv_secur1|t1	-2.207	0.104	-21.256	0.000	-2.207	-2.207
fv_secur1|t2	-1.676	0.067	-24.851	0.000	-1.676	-1.676
fv_secur1|t3	-1.225	0.052	-23.577	0.000	-1.225	-1.225
fv_secur1|t4	-0.473	0.041	-11.597	0.000	-0.473	-0.473
fv_secur1|t5	0.092	0.039	2.341	0.019	0.092	0.092
fv_secur2|t1	-2.006	0.087	-23.128	0.000	-2.006	-2.006
fv_secur2|t2	-1.418	0.057	-24.688	0.000	-1.418	-1.418
fv_secur2|t3	-0.899	0.045	-19.756	0.000	-0.899	-0.899
fv_secur2|t4	-0.246	0.040	-6.207	0.000	-0.246	-0.246
fv_secur2|t5	0.281	0.040	7.078	0.000	0.281	0.281
fv_trad1|t1	-2.236	0.107	-20.950	0.000	-2.236	-2.236
fv_trad1|t2	-1.786	0.073	-24.497	0.000	-1.786	-1.786
fv_trad1|t3	-1.290	0.054	-24.046	0.000	-1.290	-1.290
fv_trad1|t4	-0.393	0.040	-9.745	0.000	-0.393	-0.393
fv_trad1|t5	0.112	0.039	2.840	0.005	0.112	0.112

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fv_trad2|t1	-1.849	0.076	-24.186	0.000	-1.849	-1.849
fv_trad2|t2	-1.324	0.055	-24.256	0.000	-1.324	-1.324
fv_trad2|t3	-0.842	0.045	-18.850	0.000	-0.842	-0.842
fv_trad2|t4	-0.203	0.039	-5.148	0.000	-0.203	-0.203
fv_trad2|t5	0.286	0.040	7.202	0.000	0.286	0.286
gv_democ1|t1	-1.697	0.068	-24.803	0.000	-1.697	-1.697
gv_democ1|t2	-1.367	0.056	-24.476	0.000	-1.367	-1.367
gv_democ1|t3	-0.630	0.042	-14.952	0.000	-0.630	-0.630
gv_democ1|t4	0.040	0.039	1.030	0.303	0.040	0.040
gv_democ2|t1	-2.375	0.123	-19.375	0.000	-2.375	-2.375
gv_democ2|t2	-2.085	0.093	-22.452	0.000	-2.085	-2.085
gv_democ2|t3	-1.559	0.062	-24.958	0.000	-1.559	-1.559
gv_democ2|t4	-0.757	0.044	-17.398	0.000	-0.757	-0.757
gv_econ1|t1	-2.418	0.128	-18.859	0.000	-2.418	-2.418
gv_econ1|t2	-2.107	0.095	-22.249	0.000	-2.107	-2.107
gv_econ1|t3	-1.686	0.068	-24.828	0.000	-1.686	-1.686
gv_econ1|t4	-1.003	0.047	-21.226	0.000	-1.003	-1.003
gv_econ2|t1	-2.024	0.088	-22.977	0.000	-2.024	-2.024
gv_econ2|t2	-1.718	0.069	-24.745	0.000	-1.718	-1.718
gv_econ2|t3	-1.330	0.055	-24.289	0.000	-1.330	-1.330
gv_econ2|t4	-0.845	0.045	-18.907	0.000	-0.845	-0.845
gv_sci1|t1	-2.756	0.189	-14.607	0.000	-2.756	-2.756
gv_sci1|t2	-2.300	0.114	-20.244	0.000	-2.300	-2.300
gv_sci1|t3	-1.762	0.072	-24.593	0.000	-1.762	-1.762
gv_sci1|t4	-1.069	0.048	-22.051	0.000	-1.069	-1.069
gv_sci2|t1	-2.154	0.099	-21.794	0.000	-2.154	-2.154
gv_sci2|t2	-1.798	0.074	-24.443	0.000	-1.798	-1.798
gv_sci2|t3	-1.069	0.048	-22.051	0.000	-1.069	-1.069
gv_sci2|t4	-0.286	0.040	-7.202	0.000	-0.286	-0.286
as_cult1|t1	-1.798	0.074	-24.443	0.000	-1.798	-1.798
as_cult1|t2	-1.279	0.053	-23.972	0.000	-1.279	-1.279
as_cult1|t3	-0.592	0.042	-14.165	0.000	-0.592	-0.592
as_cult1|t4	0.006	0.039	0.156	0.876	0.006	0.006
as_cult2|t1	-1.489	0.060	-24.878	0.000	-1.489	-1.489
as_cult2|t2	-0.928	0.046	-20.200	0.000	-0.928	-0.928
as_cult2|t3	-0.228	0.040	-5.771	0.000	-0.228	-0.228
as_cult2|t4	0.345	0.040	8.630	0.000	0.345	0.345
as_ecol1|t1	-3.098	0.296	-10.451	0.000	-3.098	-3.098
as_ecol1|t2	-2.466	0.135	-18.270	0.000	-2.466	-2.466
as_ecol1|t3	-1.823	0.075	-24.324	0.000	-1.823	-1.823
as_ecol1|t4	-0.990	0.047	-21.067	0.000	-0.990	-0.990
as_ecol2|t1	-2.660	0.168	-15.823	0.000	-2.660	-2.660
as_ecol2|t2	-2.267	0.110	-20.615	0.000	-2.267	-2.267
as_ecol2|t3	-1.798	0.074	-24.443	0.000	-1.798	-1.798
as_ecol2|t4	-1.195	0.051	-23.322	0.000	-1.195	-1.195
as_econ1|t1	-2.154	0.099	-21.794	0.000	-2.154	-2.154
as_econ1|t2	-1.728	0.070	-24.712	0.000	-1.728	-1.728
as_econ1|t3	-1.087	0.049	-22.250	0.000	-1.087	-1.087
as_econ1|t4	-0.374	0.040	-9.312	0.000	-0.374	-0.374
as_econ2|t1	-1.954	0.083	-23.524	0.000	-1.954	-1.954
as_econ2|t2	-1.543	0.062	-24.949	0.000	-1.543	-1.543
as_econ2|t3	-1.083	0.049	-22.200	0.000	-1.083	-1.083
as_econ2|t4	-0.460	0.041	-11.289	0.000	-0.460	-0.460
hidrov_ref|t1	0.401	0.040	9.931	0.000	0.401	0.401

Variances:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
.fv_univ1	0.680				0.680	0.680
.fv_univ2	0.686				0.686	0.686
.fv_univ3	0.478				0.478	0.478
.fv_benev1	0.521				0.521	0.521
.fv_benev2	0.532				0.532	0.532
.fv_achiev1	0.622				0.622	0.622
.fv_achiev2	0.468				0.468	0.468
.fv_hedon1	0.593				0.593	0.593
.fv_hedon2	0.712				0.712	0.712
.fv_selfd1	0.768				0.768	0.768
.fv_secur1	0.672				0.672	0.672

.fv_secur2	0.677				0.677	0.677
.fv_trad1	0.527				0.527	0.527
.fv_trad2	0.738				0.738	0.738
.gv_democ1	0.638				0.638	0.638
.gv_democ2	0.590				0.590	0.590
.gv_econ1	0.599				0.599	0.599
.gv_econ2	0.764				0.764	0.764
.gv_sci1	0.773				0.773	0.773
.gv_sci2	0.815				0.815	0.815
.as_cult1	0.566				0.566	0.566
.as_cult2	0.557				0.557	0.557
.as_ecol1	0.484				0.484	0.484
.as_ecol2	0.392				0.392	0.392
.as_econ1	0.698				0.698	0.698
.as_econ2	0.594				0.594	0.594
.hidrov_ref	0.841				0.841	0.841
fv_selftr	0.320	0.032	10.068	0.000	1.000	1.000
fv_selfenh	0.378	0.037	10.123	0.000	1.000	1.000
fv_opc	0.407	0.040	10.275	0.000	1.000	1.000
fv_cons	0.328	0.027	11.927	0.000	1.000	1.000
.gv_democ	0.280	0.053	5.237	0.000	0.772	0.772
.gv_econ	0.326	0.102	3.210	0.001	0.815	0.815
.gv_sci	0.788	0.540	1.457	0.145	3.462	3.462
.as_cult	0.310	0.068	4.530	0.000	0.715	0.715
.as_ecol	0.156	0.059	2.643	0.008	0.302	0.302
.as_econ	0.229	0.073	3.120	0.002	0.756	0.756

Scales y*:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ1	1.000				1.000	1.000
fv_univ2	1.000				1.000	1.000
fv_univ3	1.000				1.000	1.000
fv_benev1	1.000				1.000	1.000
fv_benev2	1.000				1.000	1.000
fv_achiev1	1.000				1.000	1.000
fv_achiev2	1.000				1.000	1.000
fv_hedon1	1.000				1.000	1.000
fv_hedon2	1.000				1.000	1.000
fv_selfd1	1.000				1.000	1.000
fv_secur1	1.000				1.000	1.000
fv_secur2	1.000				1.000	1.000
fv_trad1	1.000				1.000	1.000
fv_trad2	1.000				1.000	1.000
gv_democ1	1.000				1.000	1.000
gv_democ2	1.000				1.000	1.000
gv_econ1	1.000				1.000	1.000
gv_econ2	1.000				1.000	1.000
gv_sci1	1.000				1.000	1.000
gv_sci2	1.000				1.000	1.000
as_cult1	1.000				1.000	1.000
as_cult2	1.000				1.000	1.000
as_ecol1	1.000				1.000	1.000
as_ecol2	1.000				1.000	1.000
as_econ1	1.000				1.000	1.000
as_econ2	1.000				1.000	1.000
hidrov_ref	1.000				1.000	1.000

C.7 Lavaan code and full summary of final full structural equation model of value landscapes and their effect on preferences in water governance

watervalues_V2.txt

```
watervalues <- '
# latent variables
fv_selftr =~ fv_univ1 + fv_univ2 + fv_univ3 + fv_benev1 + fv_benev2
fv_selfenh =~ fv_achiev1 + fv_achiev2 + fv_hedon1 + fv_hedon2
gv_democ =~ gv_democ1 + gv_democ2
gv_econ =~ gv_econ1 + gv_econ2
as_cult =~ as_cult1 + as_cult2
as_ecol =~ as_ecol1 + as_ecol2
as_econ =~ as_econ1 + as_econ2
# regressions
gv_democ ~ fv_selftr + fv_selfenh
gv_econ ~ fv_selfenh
as_ecol ~ fv_selftr
as_econ ~ fv_selfenh + gv_econ
as_cult ~ gv_democ
hidrov_ref ~ fv_selftr + fv_selfenh + gv_democ + gv_econ + as_cult + as_ecol +
as_econ
# residual covariances
gv_democ ~~ gv_econ
as_ecol ~~ as_econ + as_cult
as_econ ~~ as_cult
'

fit <- sem(watervalues, data=X170310_watervaluesR,
ordered=c("fv_univ1","fv_univ2","fv_univ3","fv_benev1","fv_benev2","fv_achiev1",
"fv_achiev2","fv_hedon1","fv_hedon2","gv_democ1","gv_democ2","gv_econ1","gv_econ
2","as_cult1","as_cult2","as_ecol1","as_ecol2","as_econ1","as_econ2","hidrov_ref
"))
summary(fit, fit.measures=TRUE, standardized=TRUE)

> summary(fit, fit.measures=TRUE, standardized=TRUE)
lavaan (0.5-23.1097) converged normally after  78 iterations

                                                  Used       Total
  Number of observations                          1028        1067

  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic               411.706     447.246
  Degrees of freedom                                152         152
  P-value (Chi-square)                            0.000       0.000
  Scaling correction factor                                   0.991
  Shift parameter                                            31.867
    for simple second-order correction (Mplus variant)

Model test baseline model:

  Minimum Function Test Statistic              7052.793    4868.284
  Degrees of freedom                                190         190
  P-value                                         0.000       0.000

User model versus baseline model:

  Comparative Fit Index (CFI)                     0.962       0.937
  Tucker-Lewis Index (TLI)                        0.953       0.921

  Robust Comparative Fit Index (CFI)                             NA
  Robust Tucker-Lewis Index (TLI)                                NA

Root Mean Square Error of Approximation:

  RMSEA                                           0.041       0.043
  90 Percent Confidence Interval          0.036   0.046       0.039  0.048
  P-value RMSEA <= 0.05                           0.999       0.989

  Robust RMSEA                                                   NA
  90 Percent Confidence Interval                                 NA     NA

Standardized Root Mean Square Residual:
```

```
  SRMR                                           0.058       0.058

Weighted Root Mean Square Residual:

  WRMR                                           1.221       1.221

Parameter Estimates:

  Information                                 Expected
  Standard Errors                           Robust.sem

Latent Variables:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  fv_selftr =~
    fv_univ1          1.000                               0.568    0.568
    fv_univ2          0.967    0.068   14.222    0.000    0.549    0.549
    fv_univ3          1.285    0.075   17.055    0.000    0.730    0.730
    fv_benev1         1.260    0.076   16.480    0.000    0.715    0.715
    fv_benev2         1.231    0.073   16.755    0.000    0.699    0.699
  fv_selfenh =~
    fv_achiev1        1.000                               0.553    0.553
    fv_achiev2        1.168    0.076   15.317    0.000    0.646    0.646
    fv_hedon1         1.177    0.080   14.761    0.000    0.651    0.651
    fv_hedon2         1.021    0.071   14.350    0.000    0.564    0.564
  gv_democ =~
    gv_democ1         1.000                               0.609    0.609
    gv_democ2         1.208    0.131    9.199    0.000    0.736    0.736
  gv_econ =~
    gv_econ1          1.000                               0.565    0.565
    gv_econ2          0.826    0.128    6.442    0.000    0.467    0.467
  as_cult =~
    as_cult1          1.000                               0.664    0.664
    as_cult2          0.995    0.097   10.277    0.000    0.661    0.661
  as_ecol =~
    as_ecol1          1.000                               0.767    0.767
    as_ecol2          0.959    0.124    7.746    0.000    0.736    0.736
  as_econ =~
    as_econ1          1.000                               0.645    0.645
    as_econ2          0.843    0.128    6.567    0.000    0.544    0.544

Regressions:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  gv_democ ~
    fv_selftr         0.232    0.072    3.225    0.001    0.217    0.217
    fv_selfenh        0.145    0.074    1.950    0.051    0.131    0.131
  gv_econ ~
    fv_selfenh        0.201    0.081    2.464    0.014    0.196    0.196
  as_ecol ~
    fv_selftr         0.549    0.086    6.382    0.000    0.406    0.406
  as_econ ~
    fv_selfenh       -0.090    0.081   -1.107    0.268   -0.077   -0.077
    gv_econ           0.662    0.127    5.210    0.000    0.580    0.580
  as_cult ~
    gv_democ          0.574    0.087    6.631    0.000    0.527    0.527
  hidrov_ref ~
    fv_selftr        -0.062    0.188   -0.332    0.740   -0.035   -0.035
    fv_selfenh        0.296    0.145    2.041    0.041    0.164    0.164
    gv_democ          0.151    0.451    0.333    0.739    0.092    0.092
    gv_econ          -0.756    0.552   -1.370    0.171   -0.428   -0.428
    as_cult           0.097    0.317    0.305    0.760    0.064    0.064
    as_ecol          -0.375    0.191   -1.961    0.050   -0.287   -0.287
    as_econ           0.384    0.299    1.285    0.199    0.248    0.248

Covariances:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
 .gv_democ ~~
   .gv_econ           0.244    0.035    7.064    0.000    0.760    0.760
```

watervalues_V2.txt

.as_ecol ~~						
.as_econ	0.098	0.037	2.665	0.008	0.263	0.263
.as_cult ~~						
.as_ecol	0.248	0.038	6.549	0.000	0.626	0.626
.as_econ	0.163	0.031	5.232	0.000	0.545	0.545
fv_selftr ~~						
fv_selfenh	0.166	0.016	10.644	0.000	0.530	0.530

Intercepts:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
.fv_univ1	0.000				0.000	0.000
.fv_univ2	0.000				0.000	0.000
.fv_univ3	0.000				0.000	0.000
.fv_benev1	0.000				0.000	0.000
.fv_benev2	0.000				0.000	0.000
.fv_achiev1	0.000				0.000	0.000
.fv_achiev2	0.000				0.000	0.000
.fv_hedon1	0.000				0.000	0.000
.fv_hedon2	0.000				0.000	0.000
.gv_democ1	0.000				0.000	0.000
.gv_democ2	0.000				0.000	0.000
.gv_econ1	0.000				0.000	0.000
.gv_econ2	0.000				0.000	0.000
.as_cult1	0.000				0.000	0.000
.as_cult2	0.000				0.000	0.000
.as_ecol1	0.000				0.000	0.000
.as_ecol2	0.000				0.000	0.000
.as_econ1	0.000				0.000	0.000
.as_econ2	0.000				0.000	0.000
.hidrov_ref	0.000				0.000	0.000
fv_selftr	0.000				0.000	0.000
fv_selfenh	0.000				0.000	0.000
.gv_democ	0.000				0.000	0.000
.gv_econ	0.000				0.000	0.000
.as_cult	0.000				0.000	0.000
.as_ecol	0.000				0.000	0.000
.as_econ	0.000				0.000	0.000

Thresholds:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ1|t1	-2.181	0.101	-21.556	0.000	-2.181	-2.181
fv_univ1|t2	-1.763	0.072	-24.624	0.000	-1.763	-1.763
fv_univ1|t3	-1.461	0.059	-24.853	0.000	-1.461	-1.461
fv_univ1|t4	-0.803	0.044	-18.221	0.000	-0.803	-0.803
fv_univ1|t5	-0.254	0.040	-6.415	0.000	-0.254	-0.254
fv_univ2|t1	-2.208	0.104	-21.275	0.000	-2.208	-2.208
fv_univ2|t2	-1.498	0.060	-24.931	0.000	-1.498	-1.498
fv_univ2|t3	-0.904	0.046	-19.871	0.000	-0.904	-0.904
fv_univ2|t4	-0.169	0.039	-4.300	0.000	-0.169	-0.169
fv_univ2|t5	0.377	0.040	9.391	0.000	0.377	0.377
fv_univ3|t1	-2.661	0.168	-15.833	0.000	-2.661	-2.661
fv_univ3|t2	-2.181	0.101	-21.556	0.000	-2.181	-2.181
fv_univ3|t3	-1.594	0.064	-24.993	0.000	-1.594	-1.594
fv_univ3|t4	-0.786	0.044	-17.931	0.000	-0.786	-0.786
fv_univ3|t5	-0.179	0.039	-4.549	0.000	-0.179	-0.179
fv_benev1|t1	-2.661	0.168	-15.833	0.000	-2.661	-2.661
fv_benev1|t2	-2.181	0.101	-21.556	0.000	-2.181	-2.181
fv_benev1|t3	-1.594	0.064	-24.993	0.000	-1.594	-1.594
fv_benev1|t4	-0.600	0.042	-14.358	0.000	-0.600	-0.600
fv_benev1|t5	0.034	0.039	0.873	0.383	0.034	0.034
fv_benev2|t1	-2.467	0.135	-18.284	0.000	-2.467	-2.467
fv_benev2|t2	-1.955	0.083	-23.549	0.000	-1.955	-1.955
fv_benev2|t3	-1.498	0.060	-24.931	0.000	-1.498	-1.498
fv_benev2|t4	-0.709	0.043	-16.519	0.000	-0.709	-0.709
fv_benev2|t5	-0.037	0.039	-0.935	0.350	-0.037	-0.037
fv_achiev1|t1	-1.468	0.059	-24.871	0.000	-1.468	-1.468
fv_achiev1|t2	-0.820	0.044	-18.510	0.000	-0.820	-0.820
fv_achiev1|t3	-0.299	0.040	-7.533	0.000	-0.299	-0.299

```
                                watervalues_V2.txt
    fv_achiev1|t4     0.299    0.040    7.533    0.000    0.299    0.299
    fv_achiev1|t5     0.734    0.043   16.992    0.000    0.734    0.734
    fv_achiev2|t1    -1.447    0.058  -24.816    0.000   -1.447   -1.447
    fv_achiev2|t2    -0.854    0.045  -19.083    0.000   -0.854   -0.854
    fv_achiev2|t3    -0.299    0.040   -7.533    0.000   -0.299   -0.299
    fv_achiev2|t4     0.322    0.040    8.091    0.000    0.322    0.322
    fv_achiev2|t5     0.743    0.043   17.169    0.000    0.743    0.743
    fv_hedon1|t1     -1.893    0.079  -23.967    0.000   -1.893   -1.893
    fv_hedon1|t2     -1.338    0.055  -24.366    0.000   -1.338   -1.338
    fv_hedon1|t3     -0.837    0.045  -18.797    0.000   -0.837   -0.837
    fv_hedon1|t4     -0.154    0.039   -3.926    0.000   -0.154   -0.154
    fv_hedon1|t5      0.328    0.040    8.215    0.000    0.328    0.328
    fv_hedon2|t1     -1.476    0.059  -24.887    0.000   -1.476   -1.476
    fv_hedon2|t2     -0.847    0.045  -18.969    0.000   -0.847   -0.847
    fv_hedon2|t3     -0.361    0.040   -9.020    0.000   -0.361   -0.361
    fv_hedon2|t4      0.181    0.039    4.611    0.000    0.181    0.181
    fv_hedon2|t5      0.579    0.042   13.933    0.000    0.579    0.579
    gv_democ1|t1     -1.698    0.068  -24.836    0.000   -1.698   -1.698
    gv_democ1|t2     -1.368    0.056  -24.519    0.000   -1.368   -1.368
    gv_democ1|t3     -0.632    0.042  -15.022    0.000   -0.632   -0.632
    gv_democ1|t4      0.039    0.039    0.998    0.319    0.039    0.039
    gv_democ2|t1     -2.376    0.123  -19.391    0.000   -2.376   -2.376
    gv_democ2|t2     -2.086    0.093  -22.474    0.000   -2.086   -2.086
    gv_democ2|t3     -1.560    0.062  -24.995    0.000   -1.560   -1.560
    gv_democ2|t4     -0.760    0.043  -17.463    0.000   -0.760   -0.760
    gv_econ1|t1      -2.419    0.128  -18.873    0.000   -2.419   -2.419
    gv_econ1|t2      -2.108    0.095  -22.271    0.000   -2.108   -2.108
    gv_econ1|t3      -1.688    0.068  -24.861    0.000   -1.688   -1.688
    gv_econ1|t4      -1.004    0.047  -21.282    0.000   -1.004   -1.004
    gv_econ2|t1      -2.026    0.088  -23.000    0.000   -2.026   -2.026
    gv_econ2|t2      -1.719    0.069  -24.777    0.000   -1.719   -1.719
    gv_econ2|t3      -1.326    0.055  -24.300    0.000   -1.326   -1.326
    gv_econ2|t4      -0.844    0.045  -18.912    0.000   -0.844   -0.844
    as_cult1|t1      -1.799    0.074  -24.473    0.000   -1.799   -1.799
    as_cult1|t2      -1.280    0.053  -24.018    0.000   -1.280   -1.280
    as_cult1|t3      -0.594    0.042  -14.236    0.000   -0.594   -0.594
    as_cult1|t4       0.007    0.039    0.187    0.852    0.007    0.007
    as_cult2|t1      -1.490    0.060  -24.917    0.000   -1.490   -1.490
    as_cult2|t2      -0.930    0.046  -20.259    0.000   -0.930   -0.930
    as_cult2|t3      -0.231    0.039   -5.856    0.000   -0.231   -0.231
    as_cult2|t4       0.346    0.040    8.649    0.000    0.346    0.346
    as_ecol1|t1      -3.098    0.296  -10.456    0.000   -3.098   -3.098
    as_ecol1|t2      -2.467    0.135  -18.284    0.000   -2.467   -2.467
    as_ecol1|t3      -1.824    0.075  -24.353    0.000   -1.824   -1.824
    as_ecol1|t4      -0.988    0.047  -21.070    0.000   -0.988   -0.988
    as_ecol2|t1      -2.661    0.168  -15.833    0.000   -2.661   -2.661
    as_ecol2|t2      -2.268    0.110  -20.632    0.000   -2.268   -2.268
    as_ecol2|t3      -1.787    0.073  -24.527    0.000   -1.787   -1.787
    as_ecol2|t4      -1.191    0.051  -23.328    0.000   -1.191   -1.191
    as_econ1|t1      -2.155    0.099  -21.814    0.000   -2.155   -2.155
    as_econ1|t2      -1.730    0.070  -24.743    0.000   -1.730   -1.730
    as_econ1|t3      -1.089    0.049  -22.303    0.000   -1.089   -1.089
    as_econ1|t4      -0.374    0.040   -9.330    0.000   -0.374   -0.374
    as_econ2|t1      -1.955    0.083  -23.549    0.000   -1.955   -1.955
    as_econ2|t2      -1.544    0.062  -24.986    0.000   -1.544   -1.544
    as_econ2|t3      -1.084    0.049  -22.253    0.000   -1.084   -1.084
    as_econ2|t4      -0.457    0.041  -11.242    0.000   -0.457   -0.457
    hidrov_ref|t1     0.401    0.040    9.948    0.000    0.401    0.401

Variances:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
   .fv_univ1          0.678                               0.678    0.678
   .fv_univ2          0.699                               0.699    0.699
   .fv_univ3          0.467                               0.467    0.467
   .fv_benev1         0.488                               0.488    0.488
   .fv_benev2         0.511                               0.511    0.511
   .fv_achiev1        0.694                               0.694    0.694
   .fv_achiev2        0.583                               0.583    0.583
```

watervalues_V2.txt

.fv_hedon1	0.577				0.577	0.577
.fv_hedon2	0.681				0.681	0.681
.gv_democ1	0.629				0.629	0.629
.gv_democ2	0.459				0.459	0.459
.gv_econ1	0.681				0.681	0.681
.gv_econ2	0.782				0.782	0.782
.as_cult1	0.559				0.559	0.559
.as_cult2	0.563				0.563	0.563
.as_ecol1	0.412				0.412	0.412
.as_ecol2	0.458				0.458	0.458
.as_econ1	0.584				0.584	0.584
.as_econ2	0.705				0.705	0.705
.hidrov_ref	0.867				0.867	0.867
fv_selftr	0.322	0.034	9.552	0.000	1.000	1.000
fv_selfenh	0.306	0.030	10.192	0.000	1.000	1.000
.gv_democ	0.336	0.052	6.417	0.000	0.906	0.906
.gv_econ	0.307	0.066	4.637	0.000	0.961	0.961
.as_cult	0.318	0.046	6.895	0.000	0.722	0.722
.as_ecol	0.491	0.081	6.070	0.000	0.835	0.835
.as_econ	0.280	0.069	4.082	0.000	0.675	0.675

Scales y*:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
fv_univ1	1.000				1.000	1.000
fv_univ2	1.000				1.000	1.000
fv_univ3	1.000				1.000	1.000
fv_benev1	1.000				1.000	1.000
fv_benev2	1.000				1.000	1.000
fv_achiev1	1.000				1.000	1.000
fv_achiev2	1.000				1.000	1.000
fv_hedon1	1.000				1.000	1.000
fv_hedon2	1.000				1.000	1.000
gv_democ1	1.000				1.000	1.000
gv_democ2	1.000				1.000	1.000
gv_econ1	1.000				1.000	1.000
gv_econ2	1.000				1.000	1.000
as_cult1	1.000				1.000	1.000
as_cult2	1.000				1.000	1.000
as_ecol1	1.000				1.000	1.000
as_ecol2	1.000				1.000	1.000
as_econ1	1.000				1.000	1.000
as_econ2	1.000				1.000	1.000
hidrov_ref	1.000				1.000	1.000

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